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ABSTRACT

This report provides information about the program evaluation study of a national biodiversity education program for youth in the United States known as "Windows on the World" launched by the World Wildlife Fund. The curriculum development project is organized into four phases: (1) a biodiversity needs assessment; (2) the development of biodiversity education materials and formative evaluation; (3) training and implementation; and (4) dissemination and summative evaluation of the project. The goal of the program is to educate youth about what biodiversity is, what it means to humanity, the causes behind the loss of biodiversity, and ways to address the problem. This report includes an overview of biodiversity education and the need for assessment of biodiversity literacy, a description of the development of the biodiversity education framework, details of the development of the biodiversity assessment instrument for middle school students, development and results of the formative assessment instrument for select activities, and a discussion of the use of the framework. The appendices contain a listing of the advisory board and program evaluation steering committee members, framework validation, details about the pilot studies, the formative evaluation instrument, and formative evaluation item and subscale results. Contains 141 references. (DDR)

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Report to the National Environmental Education Training Foundation on the Development of a Biodiversity Literacy Assessment Instrument

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Submitted by World Wildlife Fund in cooperation
with the Wisconsin Center for Environmental Education
at the University of Wisconsin-Stevens Point
November, 1996

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Submitted by World Wildlife Fund in cooperation
with the Wisconsin Center for Environmental Education
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November, 1996

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Development of a Biodiversity Literacy Assessment Instrument

I. Introduction

Scientific organizations around the world have raised concern about the continuous decline of the world's biodiversity. In the United States, the National Academy of Sciences and the Science Advisory Board to the U.S. Environmental Protection Agency have suggested that it is one of the most critical environmental problems facing the world.

Although some of our best scientific minds are in general agreement that loss of biodiversity is a global concern, there seems to be limited awareness of the problem among the general public. In 1992, a national opinion survey conducted by Peter Hart Research Associates found only one percent of those surveyed listed endangered species as a serious environmental problem. When given the opportunity, no respondents listed loss of biodiversity as a problem and only one in five said they had never heard of 'loss of biological diversity'. When presented with the concerns expressed by scientists, most respondents expressed their new found concern and suggested that educational programs should be initiated to make the public more aware of the problem.

Overview of Biodiversity Education

World Wildlife Fund (WWF) is one scientific organization that has dedicated its efforts to protect biodiversity. It has concerned itself with the lack of public awareness by initiating a variety of biodiversity education programs around the world. In 1993, with funding from Eastman Kodak Company, World Wildlife Fund elected to launch a national biodiversity education program for youth in the United States. The goal of the program is to educate youth about what biodiversity is, what it means to humanity, the causes behind the loss of biodiversity and ways to address the problem. The title of the program became *Windows on the Wild.*

To help plan and guide the *Windows on the Wild* effort, WWF assembled an advisory board of relevant educational leaders from around the country (Appendix A). The advisory board ultimately decided that the *Windows on the Wild* program would initially be directed at students in middle school (i.e., 6-9th grades). It was felt that this age level had the ability to both understand the problem and to take or initiate personal actions or behaviors related to the problem. The advisory board also agreed on four phases for the *Windows on the Wild* effort which are listed below.

Phase I	Biodiversity Education Need Assessment. Answering the questions: What is being taught? What should be taught? Who should teach it? What resources do educators need?
Phase II	Development of biodiversity education materials and formative evaluation.
Phase III	Training and implementation
Phase IV	Dissemination and summative evaluation of the *Windows on the Wild* program.

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Funding provided by the National Environmental Education and Training Foundation (NEETF) contributed to the completion of Phase I and to significant progress on Phase II. In particular, NEETF funds were used for Phase I to determine what should be taught to middle school youth (i.e., development of biodiversity literacy framework). In addition, for Phase II, NEETF funds were used to develop an assessment instrument that might serve to determine what students know, feel, and do about protecting biodiversity. It was hoped that this instrument would also be sensitive enough to determine if change in biodiversity literacy occurs as a result of involvement in the *Windows on the Wild* program or some other relevant biodiversity instruction.

Need for Assessment of Biodiversity Literacy

The need to invest resources into the development of a biodiversity education framework and middle school assessment instrument was justified by an extensive literature search which suggested no such documents existed for use in general, or more specifically, for use in evaluating the effectiveness of the *Windows on the Wild* curriculum.

WWF established a partnership with the Wisconsin Center for Environmental Education (WCEE) at the University of Wisconsin-Stevens Point to develop the framework and assessment instrument. Staff at the WCEE have extensive experience in developing educational frameworks and assessment instruments at both the state and national levels. Additionally, WWF secured a Program Evaluation Steering Committee (PESC) of nationally known educational researchers to oversee the project (Appendix B).

A research assistant (i.e., AnneMarie VanDam) was hired to serve as primary day-to-day staff for the project. Ms. VanDam was working on her MS degree in environmental education and her thesis was based on the development of the assessment instrument.

II. Development of the Biodiversity Education Framework

As a first step to developing the *Windows on the Wild* curriculum, it was important to develop a conceptual outline or framework of what biodiversity concepts should be covered in a comprehensive curriculum. This framework would also serve as a guideline for the development of relevant assessment instruments.

Validation of the Biodiversity Education Framework

An extensive literature review was conducted to identify concepts that professionals around the world felt were important to a basic citizen understanding of biodiversity. Project staff then used this information to develop a draft biodiversity education framework. This draft was sent out for a preliminary review to relevant members of the PESC. Preliminary revisions were made and the framework was then sent out for a more formal review and validation. Copies were sent to members of the National Advisory Committee and the PESC (Appendices A and B). The forms used in this review/validation process are found in Appendix C.

Using feedback from this formal validation process, a biodiversity education framework was ultimately revised and developed. The resulting framework (see following page) then served as the content basis for both the development of the *Windows on the Wild* curriculum and the biodiversity assessment instrument for middle school students.

World Wildlife Fund - *Windows on the Wild*
Biodiversity Education Framework

I. Key Concepts

Definition

- Biological diversity, or "biodiversity," encompasses the variety of all life on Earth from microscopic plants to blue whales. It also includes the variety of ecosystems and ecological processes that sustain this life.
- Biodiversity is commonly analyzed at these three levels:
    1. Ecosystem diversity refers to the variety of habitats, biological communities, and ecosystems where organisms live and evolve. It also refers to the variety of ecological processes within ecosystems.
    2. Species diversity describes the numbers and variety of habitats, biological communities, and ecosystems where organisms live and evolve. It also refers to the variety of ecological processes within ecosystems.
    3. Genetic diversity refers to the sum total of genetic information contained in the genes of organisms. This can be examined at the level of individuals, populations, or species.

Factors Affecting Biodiversity

- Natural systems are dynamic and disturbances help maintain ecosystem health. Small scale disturbances, such as a tree falling in a forest, can actually maintain or increase biodiversity.
- Biodiversity is the key to the resilience of nature after intense changes in environmental conditions such as floods, earthquakes, hurricanes, and volcanic eruptions.
- Human-induced changes in the environment, such as pollution, habitat degradation, and the introduction of exotic species, push the limits of nature's resilience and may lead to irreversible environmental damage and biodiversity loss on human time scales.
- Biodiversity is reduced by changes in the environment that exceed the ability of populations of plants, animals, and other living things to adapt. This inability to adapt to changing environmental conditions leads to the extinction of species - either locally or globally.
- The loss and degradation of entire ecosystems, such as forests, wetlands, and coastal waters, is the single most important factor behind the current extinction of species. This large-scale degradation is the result of human population growth, pollution, and nonsustainable consumption patterns.

The Value of Biodiversity

- Biodiversity helps support life on Earth in many ways. For example, genetic diversity within species allows species to adapt to changes in the environment over time; species diversity provides a variety of interactions that contribute to energy flow and nutrient cycling in ecosystems; and ecosystem diversity provides a suite of ecological "services" that maintain the biosphere, including water and air purification, micro-climate control, and soil stability.

- Human welfare depends on biological diversity for economic benefits such as sustaining and improving agriculture and providing opportunities for medical discoveries and industrial innovations.
- Although not as apparent, the long-term value of biodiversity is just as significant as the value today.
- People value biodiversity for aesthetic, moral, spiritual, educational, economic, recreational, and other reasons.
- Culture is closely linked to biodiversity. Our cultures are shaped, in part, by the environment. And our collective knowledge of biodiversity, including its use and management, is linked to the many ways different cultures interact with the environment. Efforts to conserve biodiversity must be developed within the constructs of local cultures. Conversely, conserving biodiversity often helps strengthen cultural integrity and values.
- There are many interrelated political, economic, and social issues that develop as a result of human impact on biodiversity.

II. Biodiversity Issues

- The human impact on biodiversity is more significant today than ever before.
- Environmental problems associated with biodiversity loss don't always adversely affect all people in a region equally - they often disproportionately affect only certain populations, such as low-income communities.
- Biodiversity issues are associated with conflicts in values and beliefs.
- Individuals play an important role in resolving biodiversity problems and issues.
- Scientific and technological means exist to manage and protect biodiversity; however, science and technology may not always be adequate to resolve biodiversity problems and issues.
- Sociopolitical (educational/legal/economic/political/cultural) processes and institutions can be used to resolve biodiversity issues.

III. Actions and Skills

Students should be able to:

- identify changes in biodiversity at their local level.
- investigate and analyze patterns and structural foundations of biodiversity issues.
- synthesize and evaluate gathered information including biographies of conservationists and success stories, to identify models and alternate solutions.
- clarify and analyze their own values and priorities held by others on biodiversity issues.
- identify alternative values or priorities held by others on biodiversity issues.
- participate effectively in group problem solving activities.
- effectively communicate ideas and information about biodiversity issues.
- effectively implement selected actions regarding local and global biodiversity problems and solutions.
- know how to work cooperatively with others to establish objectives and develop new habits of thinking, valuing, and acting.

III. Development of the Biodiversity Assessment Instrument for Middle School Students

The following schematic presents an overview of the various steps involved with the development of a biodiversity assessment instrument for middle school students. NEETF funds were used to support these steps. Again, the process spanned a two-year period. Step one (i.e., validation of the framework) was described in the previous section of this paper. Each of the additional steps used to develop the instrument are summarized below.

Steps for Instrument Development

Validation of *Windows on the Wild* Biodiversity Education Framework
↓
Development of Item Pool
↓
Validation of Item Pool by Teachers and Specialists
↓
Revision of Item Pool Using Feedback of Validity Panel
↓
Distribution of Revised Item Pool into Three Pilot Instruments
↓
May 1995 Pilot with 18 Classrooms
↓
Analysis of May 1995 Pilot Results
↓
Development of December 1995 Pilot Instrument
↓
December 1995 Pilot with 10 Classrooms
↓
Analysis of December 1995 Pilot Results
↓
Compilation of Best Performing Items into Final Instrument
↓
Formative Evaluation of *Windows on the Wild* Activities

Development of the Item Pool

A pool of possible assessment questions needed to be developed which addressed both the biodiversity framework and the pedagogic level of the middle school students. Also, as directed by the framework, items needed to address both cognitive and affective aspects of biodiversity literacy.

A literature search was conducted in an attempt to identify existing test items that could be used. Only a few items were collected or revised from existing environmental literacy assessment instruments (Peri, 1996; Quale, 1993; Schurr, 1992; and WRI, 1992/93).

Ultimately, an item pool was drafted by the research staff. Most of the cognitive items were written as multiple choice questions. They were written to address both the biodiversity framework and Bloom's Taxonomy of Educational Objectives (Bloom, 1956). Over one hundred items were written to address the cognitive domain. A higher proportion of the items were written at the levels of knowledge, comprehension and application levels of Bloom's taxonomy than were written at the levels of analysis, synthesis and evaluation. Although this is a common evaluation flaw (Tuckman, 1975), it was accepted as a limitation of this testing instrument in light of the fact that higher levels of thinking would be addressed in other components of the *Windows on the Wild* program evaluation.

Likert-type items (i.e., strongly agree to strongly disagree) were written to address the affective components of the framework. Again, only a few of the items came directly or were modified from existing instruments (Peri, 1996; and Quale, 1993). Over one hundred items were developed to address the affective domain. They were written to measure outcomes of environmental sensitivity, values, locus of control, assumption of personal responsibility, and assumption of societal responsibility. These various areas were then treated as potential subscales.

Draft items were sent to relevant teachers and other education specialists for formal review (Appendix D). Each item was placed into a matrix that asked for a response evaluating four areas: content validity, difficulty, accuracy, and distracters (distracters are the incorrect options to a question and were only evaluated for the multiple choice items). The reviewer was asked to rate each area for each item by circling a number on a scale of 1-4. Space was also provided for additional comments, which were strongly encouraged. As a result of this external review numerous items were rewritten or eliminated.

Piloting Testing

Following the final reviews and revisions, the item pool was left with a total of 196 assessment items. These were considered the best questions from the original pool and the research staff felt confident these questions would have the best potential for scoring well in the rigorous item analysis that would occur as a result of piloting.

It was determined by the PESC that three pilots should be conducted. The first pilot would emphasize item analysis. From the results, items would be selected to develop a draft biodiversity literacy assessment instrument. This instrument would then be piloted to evaluate the effectiveness of the whole test. The third pilot would involve using an instrument to test the effectiveness of *Windows on the Wild* curriculum materials.

The item analysis pilots were conducted in May 1995 and the draft instrument pilot was conducted in December of 1995. The pre-test post-test formative evaluation of *Windows on the Wild* activities was conducted in April 1996.

Populations used in all pilots were selected based on availability, geographic distribution (i.e., across the country and proximity to major urban areas) and teacher awareness of the *Windows on the Wild* program. Specific population used in each pilot are presented in Appendix E. Generally, students in the pilots came from Washington, DC, Atlanta, GA, Rochester, NY, Chicago, IL, and Seattle, WA.

Item Analysis Pilots (May 1995)

For the item analysis pilots items were assembled into three different pilot test instruments. This was done because there were too many items to put into one instrument. An effort was made to equally distribute the items among the three tests according to the framework so that each pilot contained items that tested every portion of the framework. An effort was also made to assure that similar but opposing items were placed on different pilots. For example, a value statement that was worded positively was placed on a different pilot than the same value statement that was worded negatively. This was done for comparison purposes during the analysis.

Each pilot included a few introductory questions asked to gather some basic information about the student population, including gender, interest in environmental topics, and source of environmental knowledge. Students were also asked to identify themselves as average, below average, or above average regarding their knowledge about the environment. This was done to determine if items could discriminate between those who are possibly more knowledgeable vs. the average students.

The three pilot tests (Pilots A, B, and C) were sent to a total of 18 classrooms (six classes per pilot). Most of the teachers involved (all but three) had been item reviewers and had expressed interest in piloting with their students. The teachers were sent detailed instructions to read to their classes. Scantron scoring sheets were sent and pencils were provided. In addition, slips of paper with a definition of biodiversity were provided for every student. This was done because there was concern about the language difficulty of the items. The definition was very basic and did not answer any of the questions included on a pilot (see Appendix F for letter, instruction pages, and definition as provided to the teachers.)

Teachers were also asked to answer a few questions about their class and to identify students whom they considered to be "particularly knowledgeable and concerned about the environment and environmental issues." This information was asked so that teacher responses could be compared to student responses to a similar question. Because the pilots were sent at a busy time of the school year, teachers were given the remainder of their school year to conduct the pilot and return the answer sheets.

Answer sheets were received from all classrooms and prepared (i.e., cleaned up) for mechanical scoring. Answer sheets were scanned at the Information Technology Office at the University of Wisconsin-Stevens Point. The response data was then analyzed by researchers at the WCEE using the SPSS statistical software package.

Results of item analysis are in Appendix E. Following is an overview of the analysis and criteria that were used to evaluate and select items for the draft instrument that would be used in the second pilot. Items were considered to have potential based on the following criteria.

Affective Items:

1. if the item were deleted from the subscale, the reliability of the subscale would be decreased (the decrease in alpha if the item was removed was ≥ .0050)
2. the correlation of the item to other items within the same subscale (i.e., same part of framework) was ≥ .25
3. the mean score of the item was between 1.0 and 2.0 on the recoded scale of 0-3
4. the standard deviation was ≥.75 (A high standard deviation indicates a high range of responses, which is desirable in a study that is measuring change.)
5. responses were distributed among the choices of "strongly agree" to "strongly disagree"
6. there was evidence that the item was part of a subscale that discriminated between the general population and students identified as more environmentally aware

Cognitive Items:

1. if the item were deleted from the subscale, the reliability of the subscale would be decreased (the decrease in alpha if the item was removed was ≥.0050)
2. the correlation of the item to other items within the same subscale (i.e., same part of the framework) was ≥.25
3. a higher percentage of students scoring in the top quintile groups selected the preferred answer (indicated by a positive discrimination score) while higher percentages of students in the bottom quintile groups selected each distracter (indicated by negative discrimination scores)
4. the foils or distracters were selected at roughly equivalent rates or each was selected by a minimum of five percent of the students
5. the difficulty factor of an item ranged from .50 to .75
6. there was evidence that the item was part of a subscale that discriminated between the general population and students identified as more environmentally aware

Instrument Pilot (December 1995)

Researchers at the WCEE selected the best items from the May 1995 pilots and compared them to the framework to determine how well they covered the various components of the framework. Some sections of the framework had several items that had performed well and some had very few. An overview of how items progress (i.e., number of items relative to framework) from the pilots to selection for the final draft instrument is presented in Appendix E. To cover weak areas, new items were drafted or old items were again revised. A test of 158 questions was developed for the second pilot.

The pilots were conducted with students from the same pilot areas used in the May 1995 pilots (Appendix F). However, fewer classrooms were involved since teachers had to agree to administer the test over two class periods. The same item analysis procedures were used in the December pilot as were used to evaluate items in the May pilot.

Results of item analysis relative to the December pilot are presented in Appendix G. It was from this pool that items were selected to develop an instrument to be used in exploring the effectiveness of the *Windows on the Wild* curriculum.

Discrimination Ability of the Pilot Instruments

As described earlier, each of the pilots asked students to rank themselves as "above average," "average," or "below average" when it came to understanding problems about the environment. Teachers were also asked to similarly rank the students in their classes. The self- identified, teacher-identified and double-identified (i.e., both teacher and self identified) responses were analyzed as separate populations and the results were then compared to the non-identified students (Appendix H). These results helped to determine if subscales discriminate between environmentally aware students and the general population.

IV. Formative Assessment of Select *Windows on the Wild* Activities

Development of Formative Evaluation Instrument

In April 1996, a biodiversity instrument was constructed from the item pool that was piloted in December 1995. This instrument was constructed with the intent of using it to determine its potential for evaluating the effectiveness of select *Windows on the Wild* activities. The instrument was administered as a pretest-posttest evaluation. It was hypothesized that if the curriculum was effective (i.e.; relative to the biodiversity framework) and the instrument was adequately sensitive, theoretically, a significant change in test scores would occur from pre to post.

Because of the large number of items in the December pilot, a test had to be developed with considerably less items and time commitment. Teachers repeatedly suggested that the instrument should not take more than one class period to complete. As in the previous pilots, items for the April pilot were again selected relative to the framework and strength of the item analysis results. The formative evaluation instrument ultimately consisted of nine introductory/demographic items, thirty-nine affective Likert items, and thirty-two cognitive multiple choice items (Appendix I). The test was also characterized by three potential subscales. Questions 11-30 established what was titled the efficacy subscale. These questions related to the students' feelings of personal control, hopefulness/hopelessness, personal responsibility, and the responsibility of others relative to maintaining the integrity of biodiversity. Questions 10, 31-48 established the attitudes/values subscale. Questions 49-80 established the cognitive or knowledge subscale.

Three teachers were identified who agreed to use the set of *Windows on the Wild* activities and pre/posttest their students. The teachers names and locations are presented below.

Alisa Benway and Connie Skelton
Williamsberg Middle School
3600 N Horizon St.
Arlington, VA 22207
N=81 students

Jean Kellogg
Briar-Terrace Middle School
22200 Brier Rd.
Brier, WA
N=93 students

These teachers received the following materials.

1. Instructions for conducting the activities and tests.
2. Testing booklets, Scantron answer sheets
3. Five *Windows on the Wild* Activities
4. Various student resources needed to run the activities.

The activities sent to the teachers were selected from the introductory module (i.e., Biodiversity Basics) to the *Windows on the Wild* curriculum. These activities were selected because collectively they addressed a fair amount of the biodiversity education framework. The titles of the activities are listed below. Copies of the activities can be requested from the World Wildlife Fund.

1. What's Your Biodiversity IQ?
2. Biodiversity-The Spice of Life
3. Panthers and Hippos...Oh My!
4. Secret Service Part I
5. Future Worlds

Teachers were asked to give the pretest prior to any discussion of biodiversity concepts with the students. Following the pretest, they were asked to conduct the five activities within a two-week span. They were to spend no more than one class period on each activity. A total of one hundred seventy-four pretests and post tests were returned by the teachers.

Results from Formative Evaluation Instrument

Item by item results (frequencies) of the whole group (i.e., both classes combined pre and post test scores) are found in Appendix J. Pre and post test scores by subscale relative to the whole population are presented in Appendix K.

On the attitude/value subscale there was a significant pre-post change for the whole population and for each of the individual classes. For the cognitive subscale, there was a significant pre-post change for the whole population and for the Washington class (assuming .05 as the minimum significance level). No significant change occurred in the Arlington class. Relative to efficacy, no significant change occurred in either class.

These findings would suggest that the activities may have had some effect on the attitudes and values of the students. Results also indicate that there is potenital for cognitive change. The lack of any significant change in perceived efficacy is interesting. Either the activities did not address this concept, the test was not sensitive enough to detect change, or students have an efficacy profile that is well established..

This pilot seems to suggest that the activities did have some impact and that the test was sensitive enough to detect some change in affective and cognitive disposition of the students as a result of experiencing the *Windows on the Wild* activities. It is important however to note that this was only a pilot exercise and to suggest real change as result of using the activities or to confirm the sensitivity of the test will require a more thorough study using appropriate control groups.

IV. Conclusions and Recommendations

Use of the Biodiversity Education Framework and Item Pool

The biodiversity education framework that was developed as part of the project can be used to guide the development of a comprehensive biodiversity education program or to develop an educational program on a select aspect of biodiversity. The framework could be used to guide program development at the adult or youth levels. The framework provides the collective thoughts of relevant professionals around the country as to what concepts should be taught under the umbrella of biodiversity literacy for the general citizenry.

Thus far, indications are that the biodiversity item pool developed in this project has potential for yielding the development of evaluation tools to test levels of biodiversity literacy among populations of middle school students. Of course, there are many variables that effect the reliability and validity of a test in any given situation.

The item pool might be used to evaluate biodiversity literacy of middle school students in general or as a tool to potentially measure change as a result of an educational program. If the intent is to measure the general level of biodiversity literacy in students at any given time, then questions should be sampled from the item pool which reflect all aspects of the biodiversity framework. Because no national norm for the test exists, results would have to be interpreted relative to expectations of the evaluator(s) (i.e., given particular results or scores, does the evaluator(s) feel the students did well or not).

If the intent is to measure change in students as a result of an educational program, then it is recommended that items be selected that relate as closely as possible to the objectives of the program or activities students will experience. A pre/posttest methodology would then be the most effective approach.

Future Evaluation of *Windows on the Wild* Using the Biodiversity Item Pool

The pilot evaluation of activities from the first *Windows on the Wild* module showed promise both in terms of the effectiveness of the curriculum and in terms of the effectiveness of the biodiversity item pool to discriminate change as a result of a relevant educational program.

Although *Windows on the Wild* materials are still being developed, plans are being made to conduct a more comprehensive assessment of the materials using the biodiversity item pool. A pre-test post-test evaluation will be conducted using a stronger research design than was used in the May 1996 pilot. A Solomon Four-Group Design will be used in the next round of testing. Also, more definitive results may be obtained with a more comprehensive set of activities.

Summary of Products Resulting From NEETF Funding

The NEETF funds played a very important role in helping to pursue and develop biodiversity education of adults and youth in this nation. Specifically, NEETF funds supported the ...

1) development of a biodiversity education framework that can guide the development of educational materials or programs that hope to improve biodiversity literacy.

2) development of a pool of test items that can be used to explore what middle school students feel and know about the concept of biodiversity.

3) development of an evaluation instrument that can potentially be used to test the effectiveness of middle school biodiversity education programs.

4) professional development of an individual pursuing a MS degree in environmental education. AnneMarie VanDam served as research assistant in the project which ultimately contributed to the completion of her thesis, graduation and present employment as Communications Coordinator at the Grand Traverse Regional Land Conservancy.

References

Ahearn, S.K. (1988). Education and biodiversity: Analysis of needs and some suggested activities. NAAEE 1988 Conference Proceedings, Building Multicultural Webs through Environmental Education, 51-54.

Alexander, W.M., Williams, E.L., Compton, M, Hines, V.A., & Prescott, D. (1968). The emergent middle school. New York: Holt, Rinehart and Winston.

Armstrong, J.B. (1989). An evaluation management model for environmental education programs. Dissertation Abstracts International, 51/02-A, 486.

Armstrong, J.B. & Impara, J.C. (1989/90). The effects of order of test administration on environmental attitudes. The Journal of Environmental Education, 21 (3), 37-39.

----. (1991). The impact of an environmental education program on knowledge and attitudes. The Journal of Environmental Education, 22 (4), 36-40.

Ary, D., Jacobs, L, & Razavieh, A. (1990). Introduction to research in education. Fort Worth, TX: Holt, Rinehart and Winston.

Baker, E. (1994). Making performance assessment work: The road ahead. Educational Leadership, 51 (6), 58-62.

Bellanca, J., Chapman, C., & Swartz, E. (1994). Multiple assessments for multiple intelligences. Palatine, NY: IRI/Skylight Publishing.

Bennett, D.B. (1988). Four steps to evaluating environmental education learning experiences. The Journal of Environmental Education, 20 (2), 14-21.

Bloom, B.S. (Ed.), Engelhart, M.D., Furst, E.J., Hill, W.H., & Krathwohl, D.R. (1956). Taxonomy of educational objectives. The classification of educational goals. Handbook I: Cognitive domain. New York: David McKay.

Bogan, M.B. (1992). Determining the environmental literacy of participating high school seniors from the Hillsborough and Pinellas County school districts in Florida: A curriculum study. Dissertation Abstracts International, 53/08-A, 2609.

Bohl, W. (1977). A survey of cognitive and affective components of selected environmentally-related attitudes of tenth and twelfth grade students in six mideastern, four southwestern, and twelve plains and mountain states. Dissertation Abstracts International, 37 (8): 4717-A. UMI 77-2352.

Borg, W.R. & Gall, M.D. (1989). Educational research: An introduction. (5th ed.). White Plains, NY: Longman.

Brandt, R. (1992). On performance assessment: A conversation with Grant Wiggins. Educational Leadership, 49 (8), 35-37.

Brody, M., Chipman, E. & Marion, S. (1988-89). Student knowledge of scientific and natural resource concepts concerning acidic deposition. The Journal of Environmental Education, 20 (2), 32-41.

Brody, M. J. & Koch, H. (1989-90). An assessment of 4th, 8th, and 11th grade students' knowledge related to marine science and natural resource issues. The Journal of Environmental Education, 21 (2), 16-26.

Bunting, T.E., & Cousins, L.R. (1983). Development and application of the children's environmental response inventory. The Journal of Environmental Education, 15 (1), 3-10.

Campbell, L., Campbell, B., & Dickinson, D. (1992). Teaching and learning through multiple intelligences. Stanwood, WA: New Horizons for Learning.

CCMC (Communications Consortium Media Center/Consultative Group on Biological Diversity). (1994). An analysis of public opinion on biodiversity and related environmental issues, 1990-1994. Unpublished survey.

Champeau, R. J. (1982). Development of a perceived environmental control measure. Dissertation Abstracts International, 45 (10) 2974-A.

Champeau, R.J, & Peyton, R.B. (1984). Who's in control? Developing and testing of a perceived environmental control measure. In A. Sacks (Ed.), Monographs in Environmental Education and Environmental Studies, Volume I. Columbus, Ohio: ERIC/SMEAC, 101-30.

Cohen, M.R. (1973). Environmental information versus environmental attitudes. The Journal of Environmental Education, 5 (2), 5-8.

Corcoran, P. (1985). A formative evaluation of science and natural history curriculum materials and their influence on Maine science teaching. Dissertation Abstracts International, 47/08-A, 2980.

Dewey, J. (1933). How we think. Lexington, MA: D.C. Heath and Company.

Disinger, J.F. (1981). Environmental education in the K-12 schools: A national survey. In A sacks, et al (Eds.), Current Issues in Environmental Education and Environmental Studies, Vol. VII. Columbus, Ohio: ERIC/SMEAC, pp. 141-156.

----. (1987). Learning by doing: A manual for teaching and assessing higher-order thinking in science and mathematics. (Report No. 17-HOS-80). Educational Testing Service.

Dresner, M. & Gill, M. (1994). Environmental education at summer nature camp. The Journal of Environmental Education, 25 (3), 35-41.

Eagles, F.J., & Muffitt, S. (1989/90). An analysis of children's attitudes toward animals. The Journal of Environmental Education, 21 (3), 41-44.

Edwards, A.L. (1957). Techniques of attitude scale construction. New York: Appleton-Century-Crofts.

Eiss, A.F. & Harbeck, M.B. (1969). Behavioral objectives in the affective domain. Washington, D.C.: National Science Teacher's Association.

Engleson, D. C. & Yockers, D.H. (1994). A guide to curriculum planning in environmental education. Madison, WI: WI Dept. of Public Instruction.

Euler, A. (1988). A comparative study of the effectiveness of a formal vs. nonformal environmental education program for male and female sixth-grade students' environmental knowledge and attitudes. Dissertation Abstracts International, 49/07-A, 1682.

Frazier, A. (1980). Values, curriculum, and the elementary school. Boston, MA: Houghton Mifflin.

Gardella, J.R. (1986). Assessing environmental education curricula: The environmental education curriculum inventory, forms A and B. 1986 Proceedings of the North American Association for Environmental Education (pp. 53-57). Washington, D.C.: NAAEE.

Gutierrez de White, T. & Jacobson, S.K. (1994). Evaluating conservation education programs at a South American zoo. The Journal of Environmental Education, 25 (4), 18-22.

Harris/Pew. (1993). Children and the environment: A survey of 10,375 children in grades 4-12. Unpublished survey.

Hart, P. (1993). Thoughts on research paradigm in EE. In R. Mrazek (Ed.), Alternative Paradigms in Environmental Education - NAAEE 1993 Monographs in EE and Environmental Studies - Vol. Vol. VIII (pp. 301-302). Washington, D.C.: NAAEE.

Hart, P.D. Research Associates, Inc. (1993). Highlights from a national public opinion study on biodiversity. (Available from Defenders of Wildlife, 1244 Nineteenth St. NW, Washington, DC 20036).

Harter, S. (1982). The perceived competence scale for children. Child Development, 53 (1), 87-97.

Hausbeck, K.W., Milbrath, L.W., & Enright, S.M. (1992). Environmental knowledge, awareness and concern among 11th-grade students: New York state. The Journal of Environmental Education, 24 (1), 27-34.

Herman, J. (1992). What research tells us about good assessment. Educational Leadership, 49 (8), 74-78.

Herman, J., Aschbacher, P.R., & Winters, L. (1992). A practical guide to alternative assessment. Alexandria, VA: Association for Supervision and Curriculum Development.

Herman, J.L., Morris, L.L., & Fitzgibbon, C.T. (1987). Evaluators handbook. Newbury Park, CA: Sage.

Hines, J., Hungerford, H., & Tomera, A. (1986/87). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. The Journal of Environmental Education, 18 (2), 1-8.

Hopkins, K. & Stanley, J.C. (1981). Educational and psychological measurements and evaluation (6th ed.). Englewood Cliffs, NJ: Prentice-Hall.

Horvat, R.E. & Voelker, A.M. (1976). Using a likert scale to measure environmental responsibility. The Journal of Environmental Education, 8 (1), 36-47.

Howard, A.W. & Stoumbis, G.C. (1970). The junior high and middle school: Issues and practices. Scranton, PA: Intext Educational Publishers.

Hsu, S. & Roth, R.E. (1995). An assessment of environmental knowledge and attitudes held by community leaders in the Hualien area of Taiwan. Unpublished manuscript, Ohio State University, Columbus, OH..

Hungerford, H.R., Litherland, R.A., Peyton, R.B., Ramsey, J.M., & Volk, T.L. (1988). Investigating and evaluating environmental issues and actions: skill developmental modules (teacher's edition). Champaign, Illinois: Stipes Publishing Co.

Hungerford, H., & Peyton, R.B. (1980). A paradigm for citizen responsibility: Environmental action. In A. Sacks (Ed.), Current Issues VI: The Yearbook of Environmental Education and Environmental Studies (pp. 146-154). Columbus, OH: ERIC/SMEAC.

Hungerford, H.R., Peyton, R.B., & Wilke, R.J. (1980). Goals for curriculum development in environmental education. The Journal of Environmental Education, 11 (3), 42-47.

Hungerford, H.R., Peyton, R.B., & Wilke, R.J. (1983). Yes, environmental education does have definition and structure. The Journal of Environmental Education, 14 (3), 1-12.

Hungerford, H. & Volk T. (1990). Changing learner behavior through environmental education. The Journal of Environmental Education, 21 (3), 8-21.

Hungerford, H., Volk, T., & Bluhm, W. (1994). The middle school environmental literacy instrument. Unpublished research.

Hungerford, H.R., Volk, T.L., & Ramsey, J.M. (1989). A prototype environmental education curriculum for the middle school: A discussion guide for UNESCO training seminars on environmental education. Environmental Education Series No. 29, UNESCO.

Iozzi, L.S. (1979). The environmental issues test (EIT): A new assessment instrument for environmental education. In C. Davis and A. Sacks (Eds.), Current issues in environmental education. Columbus, OH: ERIC/SMEAC.

-----. (1981). Preparing for tomorrow's world: Issues in science, technology, and society, 12 Volume Curriculum Series for Grades 7-12. (1st ed.). Longmont, Colorado: Sopris West, Inc.

-----. (1984). A summary of research in environmental education, 1971-1982. The second report of the National Commission on EE Research. Monographs in Environmental Education and Environmental Studies, no. 2. Columbus, OH: ERIC/SMEAC.

-----. (1987). Science-technology-society: Preparing for tomorrow's world. Longmont, Colorado: Sopris West.

-----. (1989). What research says to the educator - Part One: Environmental education and the affective domain. The Journal of Environmental Education, 20 (3), 3-9.

Iozzi, L.S. & Bastardo, R.J. (1990). Preparing for tomorrow's world: Issues in science, technology, and society (2nd ed.). Longmont, Colorado: Sopris West.

Iozzi, L., Laveault, D. & Marcinkowski, T. (1990, March). Assessment of learning outcomes in environmental education. Paper presented at the Programme des nations Unies pour l'Environment, Bordeaux, France (will be included as a section in a forthcoming book on evaluation in UNESCO-UNEP's Environmental Education series).

Iozzi, L. & Marcinkowksi, T. (1994, September). National evaluation of the new Project Learning Tree. Paper presented at the North American Association for Environmental Education annual conference, Cancún Mexico.

Jaus, H.H. (1984). The development and retention of environmental attitudes in elementary school children. The Journal of Environmental Education, 5 (3), 33-36.

Kagan, J. & Kogan, N. (1970). Individual variation in cognitive processes. In P.H. Mussen (Ed.), Carmichael's Manual of Child Psychology (Vol. 1). New York: John Wiley & Sons.

Kellert, S.R. (1985). Attitudes toward animals: Age-related development among children. The Journal of Environmental Education, 16 (3), 29-38.

Kohlberg, L., C., Levine, C., & Hewer, A. (1983). Moral stages: A current formulation and a response to the critics. New York: Karger.

Krathwohl, D.R., Bloom, B.S., & Masia, B.B. (1964) Taxonomy of educational objectives. Handbook II: Affective Domain. New York: David McKay.

Ladd and Bowman/American Enterprise Institute. (1995). Attitudes toward the environment: Twenty-five years after Earth Day. Unpublished survey.

Lane, J.F. (1993). An assessment of Wisconsin teacher's perceived competencies in, attitudes toward, and amount of class time devoted to teaching about the environment. Unpublished Master's Thesis, University of Wisconsin - Stevens Point.

Leeming, F. C., Dwyer, W.O., Porter, B.E., & Cobern, M. (1993). Outcome research in environmental education: A critical review. The Journal of Environmental Education, 24 (4), 8-21.

Leeming, F.C., Dwyer, W.O., & Bracken, B.A. (1995). Children's environmental attitude and knowledge scale: Construction and validation. The Journal of Environmental Education, 26 (3), 22-31.

Leopold, A. (1949). A Sand County almanac. New York: Ballantine Books.

Lerner, J. (1981). Learning disabilities (3rd ed.). Boston: Houghton Mifflin.

Lieberman/Pew Charitable Trust (1995). Pieces of a puzzle: An overview of the status of environmental education in the United States. Unpublished survey.

Linn, R.L. (1989). Educational measurement, 3rd ed. New York, NY: American Council on Education and MacMillan Publishing Co.

-----. (1993). Educational assessment: Expanded expectations and challenges. Educational Evaluation and Policy Analysis, 15 (4), 1-16.

Linn, R.L., Baker, E.L., Dunbar, S. (1991). Complex, performance-based assessment: Expectations and validation criteria. Educational Researcher, 20 (1), 15-21.

Lounsbury, J.H. & Clark, D.C. (1990). Inside grade eight: From apathy to excitement. Reston, VA: National Association of Secondary School Principals.

Lucko, B.J., Disinger, J.F., & Roth R.E. (1982). Evaluation of environmental education programs at the Elementary and Secondary School Levels. The Journal of Environmental Education, 13 (4), 7-12.

Madhagi, A. & Alwan, A. (1987). Development of a K-12 environmental education program and an evaluation instrument to measure environmental education knowledge and attitudes of Yemen Arab Republic high school students. Dissertation Abstracts International, 49:415.

Marcinkowski, T. (1989). An analysis of correlates and predictors of responsible environmental behavior. Dissertation Abstracts International, 49 (12), 3677-A. UMI No. DEW89-03716.

-----. (1993). Assessment in environmental education. In R. Wilke (Ed.), Environmental Education Teacher Resource Handbook. Millwood, NY: Kraus International. 144-197.

-----. (1994). The secondary school environmental literacy instrument. Unpublished paper.

McColskey, W. (1993, April). Matching assessment to the curriculum in a systematic science reform project. Paper presented at the annual meeting of the American Educational Research Association, Atlanta, GA.

Meredith, K. (1996). National Envirothon Environmental Literacy Evaluation. Unpublished master's thesis, University of Wisconsin, Stevens Point, WI.

Milgram, J. (1992). A portrait of diversity: The middle level student. In J. Irvin (Ed.) Transforming Middle Level Education: Perspectives and Possibilities. Needham Heights, MA: Allyn and Bacon.

Milton, B., Cleveland, E., & Bennett Gates, D. (1995). Changing perceptions of nature, self, and others: A report on a park/school program. The Journal of Environmental Education, 26 (3), 32-39.

Mitchell, R. (1992). Testing for learning: How new approaches to evaluation can improve American schools. New York: The Free Press.

Mullins, G.W., Palmer-Parfitt, K., & Watson, M.D. (1991). Critical resource issues: Interpreting biological diversity in U.S. national parks. Legacy, 2 (4), 18-23.

Musser, L.M. & Malkus, A.J. (1994). The children's attitudes toward the environment scale. The Journal of Environmental Education, 25 (3), 22-26.

Niedermeyer, F.C. (1992). A checklist for reviewing environmental education programs. The Journal of Environmental Education, 23 (2), 46-50.

Orr, D. (1992). Ecological literacy: Education and the transition to a postmodern world. Albany, NY: State University Press.

Peri, P. (1996). The development of an instrument to assess the environmental literacy of eleventh grade students in Wisconsin. Unpublished master's thesis, University of Wisconsin - Stevens Point.

Perry, D. (1993). Biodiversity and wildlife are not synonymous. Conservation Biology, 4 (1): 204-205.

Peyton, R., & Miller, B. (1980). Developing an internal locus of control as a prerequisite to environmental action taking. In A. Sacks, et al (Eds.), Current Issues VI: The Yearbook of Environmental Education and Environmental Studies (pp. 173-192). Columbus, Ohio: ERIC/SMEAC.

Peyton, R. B. et al (1992). Environmental education module on biological diversity for secondary education. Paris: UNESCO/UNEP.

Pomerantz, G. (1990-91). Evaluation of natural resource education materials: Implications for resource management. The Journal of Environmental Education, 22 (2): 16-23.

Quale, A. (1993). The development of an instrument to assess the environmental literacy of fifth grade students in Wisconsin. Unpublished master's thesis, University of Wisconsin - Stevens Point.

Ramsey, J.M. (1981). The effects of environmental action and environmental case study instruction on the overt environmental behavior of eighth-grade students. The Journal of Environmental Education, 13 (1), 24-29.

-----. (1993). The effects of issue investigation and action training on eighth-grade students' environmental behavior. The Journal of Environmental Education, 24 (3), 31-36.

Ramsey, J., Hungerford, H., & Tomera, A. (1981). The effects of environmental action and environmental case study instruction on the overt environmental behavior of eighth-grade students. The Journal of Environmental Education, 13 (1), 25-29.

Ramsey, J.M., Hungerford, H.R., & Volk, T. (1989). A technique for analyzing environmental issues. The Journal of Environmental Education, 21 (1), 26-30.

-----. (1992). Environmental education in the K-12 curriculum: Finding a niche. The Journal of Environmental Education, 23 (2) 35-45.

Ramsey, C.E. & Rickson, R.E. (1976). Environmental knowledge and attitudes. The Journal of Environmental Education, 8 (1), 10-18.

Ratanapojnard, S. (1995). Questionnaire for biodiversity-related attitudes and behaviors among fifth and sixth grade students in Thailand. Unpublished master's thesis. New Haven, CT: Yale University.

Raven, P. (1994). Why it matters, Our Planet, 6 (4), 5-8.

Raven, P. (1995). A time of catastrophic extinction: What we must do. The Futurist, 29 (5), 38-41.

Raven, P.H., Berg, L.R., & Johnson, G.B. (1993). Environment. Fort Worth, TX: Saunders College Publishing.

Rice, F.P. (1990). The adolescence (6th ed.). Boston, MA: Allyn and Bacon.

Riechard, D.E. & McGarrity, J. (1994). Early adolescents' perceptions of relative risk from 10 societal and environmental hazards. The Journal of Environmental Education, 26 (1), 16-23.

Robertson, A. (1994). Toward constructivist research in environmental education. The Journal of Environmental Education, 25 (2), 15-31.

Roper/NEETF. (1994). Environmental attitudes and behaviors of American youth, with an emphasis on youth from disadvantaged areas. Unpublished survey.

Roth, C.E. (1992). Environmental literacy: Its roots, evolution and directions in the 1990's. Columbus, OH: ERIC/CSMEE.

Rotter, J.B. (1975). Some problems and misconceptions related to the construct of internal versus external control of reinforcement. Journal of Consulting and Clinical Psychology, 45 (1), 56-67.

Schurr, S.L. (1992). The ABC's of evaluation: 26 alternative ways to assess student progress. Columbus, OH: National Middle School Association.

Seeley, M. M. (1994). The mismatch between assessment and grading. Educational Leadership, 52 (2), 4-6.

Sia, A.P., Hungerford, H.R., & Tomera, A.N. (1985/86). Selected predictors of responsible environmental behavior: An analysis. The Journal of Environmental Education, 17 (2), 31-39.

Simmons, B. (1995). Working Papers #1 through #4 for the North American Association for Environmental Education. Unpublished manuscripts, Northern Illinois University, DeKalb, IL.

Sivek, D.J. & Hungerford, H. (1989/90). Predictors of responsible behavior in members of three Wisconsin conservation organizations. The Journal of Environmental Education, 21 (2), 35-40.

Smith-Sebasto, N.J. (1995). The effects of an environmental studies course on selected variables related to environmentally responsible behavior. The Journal of Environmental Education, 26 (4), 30-34.

Stapp, W.B., Cox, D.A., Zeph, P.T. & Zimbelman, K.S. (1983). International environmental education: The Development, implementation, and evaluation of a transportation curriculum module for middle school-aged youth. The Journal of Environmental Education, 14 (3), 3-13.

Stevens, F., Lawrenz, F., & Sharp, L. (1994). User-friendly handbook for project evaluation: Science mathematics, engineering and technology education (draft version). Washington, D.C.: National Science Foundation.

Strang, R. (1957). The adolescent views himself. New York: McGraw-Hill.

Strickland, M.P., Robertson, E.B., Jettinghoff, C.R., & Diener, C.S. (1983/84). Pretest and posttest comparisons of preschool children's knowledge about energy. The Journal of Environmental Education, 15 (2), 32-35.

Stufflebeam, D., et al. (1971). Educational evaluation and decision-making. Itasca, IL: F.E. Peacock.

TenBrink, T.D. (1974). Evaluation: A practical guide for teachers. New York: McGraw-Hill.

Thomas, I.G. (1989/90). Evaluating environmental education programs using case studies. The Journal of Environmental Education, 21 (2), 3-8.

Tourtillott, L. & Britt, P. (1994). Evaluating environmental education materials. EE Toolbox: Workshop Resource Manual. Ann Arbor, MI: University of Michigan.

Tuckman, B. W. (1975). Measuring educational outcomes: Fundamentals of testing. New York: Harcourt, Brace, Jovanovich.

UNESCO (1978). Final Report: Intergovernmental Conference on Environmental Education, Tbilisi, USSR, 14-26 October 1977. Paris.

UNESCO-UNEP. (1992). Biodiversity: An increasingly important theme in environmental education. Connect: UNESCO-UNEP Environmental Education Newsletter, XVII (4), 1-2.

UNESCO-UNEP. (1993, September). All of Us. UNESCO Environmental Education Dossier series. (Available from Centre UNESCO de Catalunya, Mallorca, 285, 08037 Barcelona, Spain.)

Weller, B. (1994). Biodiversity: The new mantra. Clearing Magazine, Issue 83, March/April, 9-10.

Wiles, J. & Bondi, J. (1981). The essential middle school. Columbus, Ohio: Charles E. Merrill.

WDNR (Wisconsin Department of Natural Resources) (1996). Wisconsin's biodiversity as a management issue: A report to department of natural resource managers. Madison, WI: WI DNR.

WDPI (Wisconsin Department of Public Instruction) (1990). Administrative Rule, PI 8.01(k) 2.

World Resources Institute. (1992/93). (M. Paden, Ed.) World Resources Institute teacher's guide: 1992/93. Washington, D.C.: World Resources Institute.

World Wildlife Fund (WWF) & Wisconsin Center for Environmental Education (WCEE) (1993). Windows on the wild: Results of a national biodiversity education survey. Washington, D.C.: World Wildlife Fund.

Worthen, B. R. (1993). Critical issues that will determine the future of alternative assessment. Phi Delta Kappan, 74 (6), 444-454.

Worthen, B. & Saunders, J. (Eds.) (1973). Educational evaluation: Theory and practice. Belmont, CA: Wadsworth.

Appendix A

Windows on the Wild

Advisory Board

Advisory Board

Maria Bober
Coordinator
Worldwide Environmental
Communications
Eastman Kodak Company

David Bogan
Environmental Science Teacher
The Sidwell Friends School

Jeffery Bryant
Education Program Curator
Monterey Bay Aquarium

Gordon Cawelti
Executive Director
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Randy Champeau
Professor of Environmental Education
Director of Wisconsin Center for
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Dwight Crandell
Executive Director
St. Louis Science Center

Vicki Davison
Curator of Education
Zoo Atlanta

Carmel Ervin
Senior Secondary Education Specialist
National Museum of Natural History
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Paul Grayson
Vice President of External Affairs
Indianapolis Zoo

Steven R. Hage
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Joe Heimlich
Professor of Environmental Education
Director of ERIC Clearinghouse for
Science, Mathematics, and
Environmental Education
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Nancy A. Hotchkiss
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Lou Iozzi
Professor of Science and Environmental
Education
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David Jenkins
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National Zoological Park

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Executive Director
National Sciences Resources Center
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David Love
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World Wildlife Fund-Canada

Kathy McGlauflin
Director
Project Learning Tree

Thane Maynard
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Cincinnati Zoo & Botanical Garden

Gus Medina
Project Manager
Environmental Education and Training
Partnership
North American Association for
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Terry O'Connor
Curator of Education
Woodland Park Zoological Gardens

Mark Rovner
Vice President of Public Affairs
World Wildlife Fund

Mary Schleppegrell
Professor of Linguistics
University of California

Talbert Spence
Vice President of Education
National Audubon Society

Cathy Tompson
Curator of Education
Baltimore Zoo

Cynthia Vernon
Manager of Education Programs
Brookfield Zoo

Cherie Williams
Marine Education Specialist
The Seattle Aquarium

Keith Winsten
Curator of Education
Roger Williams Park Zoo

Appendix B

Windows on the Wild

Program Evaluation Steering Committee

Program Evaluation Steering Committee

Dr. Eric Anderson
College of Natural Resources
University of Wisconsin, Stevens Point

Judy Braus
World Wildlife Fund
Washington, D.C.

Dr. Randy Champeau
Wisconsin Center for Environmental Education
University of Wisconsin, Stevens Point

AnneMarie VanDam Fleming
Grand Traverse Regional Land Conservancy
Traverse City, MI

Dr. Paul Hart
University of Regina
Regina, Saskatchewan - Canada

Dr. Joe Heimlich
E.R.I.C./Ohio State University
Columbus, OH

Dr. Harold Hungerford
Southern Illinois University
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Dr. Lou Iozzi
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Dr. Tom Marcinkowski
Florida Institute of Technology
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Dr. Martha Monroe
Environmental Education Consultant
Takoma Park, MD

Phyllis Peri
Wisconsin Center for Environmental Education
University of Wisconsin, Stevens Point

Dr. Danie Schreuder
University of Stellenbosch
South Africa

Dr. Trudi Volk
Southern Illinois University
Carbondale, IL

Dr. Dennis Yockers
Wisconsin Center for Environmental Education
University of Wisconsin, Stevens Point

Appendix C

Framework Validation

Sample letter and evaluation form sent to framework validity reviewers

August 19, 1994

Talbert B. Spence
Dept. of Education - American Museum of Natural History
Central Park W at 79th St.
New York, NY 10024-5192

Dear Mr. Spence:

The Wisconsin Center for Environmental Education (WCEE) at the University of Wisconsin -Stevens Point and World Wildlife Fund (WWF) are working together to develop an assessment of "Windows on the Wild" -- a national biodiversity program being developed by WWF. Before WWF starts to develop materials, training designs, and evaluation strategy, it is important that the "Windows on the Wild" biodiversity education framework is validated by experts in the field. The draft framework included here has been compared to other environmental education frameworks in a document called the National Environmental Education Standards, which is being developed by the North American Association for Environmental Education (NAAEE).

We are asking that you help us validate the appropriateness and completeness of the framework. WWF will initially be using the framework to create a middle school instrument to assess biodiversity literacy. They will also be using the framework to develop biodiversity education materials for middle school students, secondary students, and the general public, and for developing workshop designs for educators.

Please review the enclosed framework, making any changes you feel are necessary directly on the copy, and complete the Validity Assessment. I would appreciate it if you could send the framework and Validity Assessment to me by September 6. If you can't meet the deadline or have any questions, I can be reached at (715) 346-4950. And if you have any questions about "Windows on the Wild" or other aspects of WWF's program, please call Judy Braus, Director of Environmental Education, at WWF. Her direct number is (202) 778-9542.

I will be calling you soon to find out if and when you will be attending the NAAEE meeting in Cancún this September. We are planning to have a short meeting with as many members of our team as possible to discuss the framework and our plans for the assessment (see enclosed half sheet). If you can't come, we'll call you after the conference to get your input.

Thanks again for agreeing to work with us on the development of this assessment. We look forward to your comments and feedback.

Sincerely,

AnneMarie VanDam - Wisconsin Center for Environmental Education

Encl: "Windows on the Wild" Biodiversity Framework
"Windows on the Wild" Framework Validity Assessment form
Scheduling sheet for NAAEE Conference

Windows on the Wild Biodiversity Framework
Validity Assessment

1. **To what extent does this framework reflect the relevant topics and issues concerning the concept of biodiversity?**

___0__________1__________2___________3__________4_______ 5_____

Don't know Not at all Slightly Moderately Considerably Completely

Comments/Suggestions:

2. **How well does the theme of "biodiversity" act as an umbrella or organizing theme for an environmental education curriculum?**

____0__________1__________2___________3__________4__________5_____

Don't know Not at all Slightly Moderately Considerably Completely

Comments/Suggestions:

3. **To what extent does this framework reflect the current views and literature on environmental literacy?**

_____0_________1_________2__________3__________4___________5_____

Don't know Not at all Slightly Moderately Considerably Completely

Comments/Suggestions:

4. To what extent is this framework relevant for the broader educational community with interests in EE (e.g., science education, social studies education, geography education, health education)?

0	**1**	**2**	**3**	**4**	**5**
Don't know	**Not at all**	**Slightly**	**Moderately**	**Considerably**	**Completely**

Comments/Suggestions:

5. To what extent is this framework relevant for use with *formal* environmental education programs?

0	**1**	**2**	**3**	**4**	**5**
Don't know	**Not at all**	**Slightly**	**Moderately**	**Considerably**	**Completely**

Comments/Suggestions:

6. To what extent is this framework relevant for use with *non-formal* environmental education programs (as in zoos, museums, nature centers, and so forth)?

0	**1**	**2**	**3**	**4**	**5**
Don't know	**Not at all**	**Slightly**	**Moderately**	**Considerably**	**Completely**

Comments/Suggestions:

7. To what extent is this framework appropriate for use as a construct in the development of an instrument to assess biodiversity literacy?

0	**1**	**2**	**3**	**4**	**5**
Don't know	**Not at all**	**Slightly**	**Moderately**	**Considerably**	**Completely**

Comments/Suggestions:

Appendix D

Item Reviewers, Process Forms, and Results

Teacher evaluators of the original item pool

Dan Bogan
Sidwell Friends School
Washington, D.C.

Marc Chappe
Conner's Emerson School
Bar Harbor, ME

Diana Cohn
Teacher/Education
Coordinator
New York, NY

Sandy Cravens
Palestine Middle School
Palestine, TX

Daniel Dunne
Monroe Middle School
Rochester, NY

Catherine Elk
Bar Harbor, Maine

Jenna Glock
Komachin Middle School
Lacey, WA

Terry Greene
Lanier Middle School
Buford, GA

Dianne Hall
Lanier Middle School
Buford, GA

Marcia Halverson
Shiloh Middle School
Lithonia, GA

Leslie Henning
Frank Wagner Middle School
Monroe, WA

Debbie Hill
Lanier Middle School
Buford, GA

Terese Johnston
George Washington Middle
School
Alexandria, VA

Sallie Kirby
Pickneyville Middle School
Norcross, GA

Bill Kreigle
Montgomery County School
System
Rockville, MD

Doug Llewellyn
Rochester City School
District
Rochester, NY

Beth Locallo
Chicago, IL

Kathryn Peecher
Revere School
Chicago, IL

Chris Pellikan
Field School
Chicago, IL

Jenny Poole
Lanier Middle School
Buford, GA

Catherine Rozi
Harborside, ME

Peggy Swenor
Petoskey Middle School
Petoskey, MI

Jose Veras
Monroe Middle School
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Julie West
North Tapps School
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Paul Winkler
Pemetic School
Southwest Harbor, ME

David Wood
Sidwell Friends School
Washington, D.C.

Terri Wright
Petoskey Middle School
Petoskey, MI

Non-teacher evaluators of the original item pool

Biodiversity Specialists:
Rich Block
World Wildlife Fund
Washington, D.C.

Dr. Eric Anderson
Professor of Wildlife
University of Wisconsin - Stevens Point

Jeff Bryant
Education Program Curator
Monterey Bay Aquarium
Monterey, California

Multicultural/Language Specialists:
Mary Schleppegrel
Linguistics Department - UC Davis
Davis, CA

Carmel Ervin
Secondary Education Specialist
National Museum of Natural History
Smithsonian Institution
Washington, D.C.

Diane Boardley-Suber
Assistant Provost
Hampton, VA

Dr. Louvenia Gaffney
Virney Elementary School
Washington, D.C.

Environmental Education Specialists:
Janet Ady
Fish and Wildlife Service
Washington, D.C.

Lori Mann, Education Director
Coyote Point Museum
Burlingame, CA

Ed McCrea
North American Association for EE
Washington, D.C.

Bill Andrews
Consultant, Science and EE
California Dept. of Education
Sacramento, CA

Educational Evaluation Specialists:
Dr. Lou Iozzi
Rutgers University
Caldwell, NJ

Dr. Joe Heimlich
E.R.I.C./Ohio State University
Columbus, OH

Dr. Martha Monroe
Environmental Education Consultant
Takoma Park, MD

Dr. Paul Hart
University of Regina
Saskatchewan, Canada

Sample letter, instructions, and evaluation form sent to original item pool evaluators

February 9, 1995

Dear,

World Wildlife Fund (WWF) is currently developing a variety of interdisciplinary education materials to help middle school students understand biodiversity issues and their connection to them. The materials will emphasize community investigations, use of real data and case studies, communication skills, and critical thinking skills. To date we've developed *WOW!* -- a biodiversity primer for middle school students that provides an overview of biodiversity issues through fiction and nonfiction articles. The primer will serve as a reading component to the program and will complement the *Windows on the Wild* curriculum materials WWF is now writing. (A copy is included for you.)

WWF is also working with the Wisconsin Center for Environmental Education (WCEE) to develop a survey instrument to gather baseline data on what students currently know and feel about biodiversity-related issues. The instrument will be used before and after students use the *Windows on the Wild* curriculum materials.

To ensure that the instrument is valid and reliable, we need professionals like yourself to review the items and provide us with feedback. We have developed a pool of approximately 200 questions. We'd like you to review about 100 of these questions looking at four critical areas: match to program objectives, readability, accuracy, and appropriateness of incorrect responses. (Specific review directions are included on page III. of this packet).

Once the instrument is developed, we will pilot it with students in classrooms across the country and make additional revisions based on the results of the pilot test. If you are a teacher and would be interested in piloting versions of the instrument this spring or next year, please let us know by checking "yes" on the cover sheet of this packet.

If you would like more information about the assessment or about the *Windows on the Wild* program, please call Margaret Pennock at 202-778-9503. She will also be happy to keep you posted on additional ways you can be involved in the development and implementation of *Windows on the Wild.*

Thank you very much for agreeing to participate in this part of the assessment process. Your feedback will help us develop a high-quality instrument that can gather baseline data about student knowledge and attitudes. Please mail your materials back to WCEE by February 25. As a small token of our appreciation, WWF will be sending you a $100 honorarium within a few weeks of receiving your feedback.

Thanks again for your willingness to assist with this project.

Sincerely,

Judy Braus
Director of Environmental Education

INSTRUCTIONS FOR ITEM EVALUATION

Thanks again for helping us with the development of this assessment. To make your job easier, we included only one or two items on each side of the page. At the top of each page, you'll find an objective. Each objective corresponds to the *Windows on the Wild* Outline for Instrument Development (pp. IV-V of the packet). We recommend that you look the outline over now and refer to it as you read each item.

Below each objective, you'll find one or more items. Some items are multiple choice with 4 possible answers. The correct answer to each multiple choice question is shown with an arrow (⇨). Other items are based on a likert scale and help to measure attitudes, values, and beliefs.

Directly below each item are four rating scales for you to complete. Descriptions of each are given below. You are asked to respond to each scale on this basis:

ITEM EVALUATION SCALE: 1 = lowest rating; 5 = highest rating

Content Validity:	Does the item adequately address the objective to which it corresponds?
Readability:	Is the item clearly written in language that 7th and 8th graders should be able to understand? If not, how would you change it to make it more readable?
Accuracy:	Is there clearly a scientifically-correct answer to the multiple-choice items? Do the attitude items offer non-biased options for students?
Distracters:	Are the distracters too obvious or too difficult? Can you think of a distracter that might be more appropriate? (A distracter is any of the incorrect answer options in multiple-choice test items. Students who are **not** familiar with the information are more likely to choose a good distracter than the correct answer. Students who are familiar with the information should be able to clearly choose the correct answer.)
Comments:	Your comments are probably the most valuable feedback you can give us. This includes editing or rewriting items if they can be improved.

After you have reviewed the items on each page, please return the packet to us in the same envelope it came in (postage and mailing label enclosed). Please mail by March 17, 1995. If you have any questions about the format or process, don't hesitate to call AnneMarie VanDam at:

Wisconsin Center for Environmental Education
403 LRC - University of Wisconsin
Stevens Point, WI 54481
Phone: (715)346-4950/Fax: (715)346-3025

Item Evaluation Packet

Please return this sheet with your items.

❋ **NAME and**
ORGANIZATION:____

❋ **Best Mailing Address and Phone # to reach you:**

____

____

____

❋ **Can you recommend a 7th or 8th grade teacher who may be interested in piloting the biodiversity assessment with their class? If so, please write their name, school, and a way to contact them. Thank you!**

____

____

____

____

PLEASE CHECK TO MAKE SURE THAT YOUR PACKET CONTAINS THE FOLLOWING ITEMS:

1. **Instructions for Item Evaluation sheet**
2. ***Windows on the Wild* Outline for Instrument Development (2 pages)**
3. **24 pages of item evaluation forms (back to back)**

NOTE: If you are missing any of these items, please contact AnneMarie VanDam at the Wisconsin Center for Environmental Education. **Phone:(715) 346-4950 or Fax: (715) 346-3025**

ITEM EVALUATION FORM

OUTLINE: IA. Knowledge of Ecological Principles and
OBJECTIVE Processes Related to Biodiversity
1. Three Levels of Biodiversity

Question #1: Biodiversity includes:

⇨ a. genetic, species and ecosystem diversity.
b. species diversity only.
c. species and ecosystem diversity.
d. genetic and species diversity.

Content Validity	Readability	Accuracy	Distracters
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

COMMENTS:

****

Question#2: Match the letter below with the phrase that most correctly describes it:

a. mountains, deserts, rainforests, grasslands
b. prairie dogs, red-tailed hawks, field mice, orchids
c. panther, cougar, mountain lion, puma

___ genetic diversity (c)
___ ecosystem diversity (a)
___ species diversity (b)

Content Validity	Readability	Accuracy	Distracters
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

COMMENTS:

Numerical results from original item pool evaluation

** Below are the numerical results of four categories for which the original item pool was evaluated. The "Specialist" results refer to the non-teacher reviewers: ecologist/biodiversity specialists, multicultural/linguistic specialists, environmental education evaluation specialists, and environmental education specialists. Note that only content validity and readability results were reported for the Likert items.*

SC = "Specialist" Content Validity	**TC** = Teacher Content Validity
SR = "Specialist" Readability	**TR** = Teacher Readability
SA = "Specialist" Accuracy	**TA** = Teacher Accuracy
SD = "Specialist" Distracters	**TD** = Teacher Distracters

***M* = Mean** ***N* = Number of respondents** **1 = lowest rating 5 = highest rating**

	SC		TC		SR		TR		SA		TA		SD		TD	
ITEM #	*M*	*N*	*M*	*N*	*M*	*N*	*M*	*N*	*M*	*N*	*M*	*N*	*M*	*N*	*M*	N
1	4.9	7	4.6	10	3.7	6	4.1	8	4.9	7	4.6	10	4.0	6	4.0	10
2	4.7	9	4.4	10	3.7	6	4.0	9	4.1	7	3.8	10	4.4	5	4.0	5
3	4.9	7	4.9	8	4.7	7	4.5	8	4.7	7	4.7	8	4.3	7	3.9	8
4	4.7	6	5.0	8	4.8	6	4.4	8	4.6	5	4.7	8	4.3	6	4.3	8
5	4.1	7	4.3	9	4.3	6	4.2	9	4.7	7	4.4	9	3.3	6	3.6	9
6	4.0	6	4.3	9	3.6	7	4.0	9	4.8	4	4.3	9	4.0	4	3.7	9
7	5.0	6	4.2	9	4.7	6	3.8	9	5.0	6	4.2	10	4.0	6	3.6	9
8	4.9	7	4.9	10	5.0	7	4.6	10	4.9	7	4.6	10	4.7	6	4.2	10
9	4.1	7	4.6	8	5.0	7	4.4	8	4.9	7	4.7	9	4.9	7	4.8	8
10	4.4	7	4.8	8	4.6	7	4.6	8	4.9	7	4.4	9	4.1	7	3.6	8
11	5.0	6	4.8	9	4.8	6	4.7	9	5.0	6	4.8	9	4.8	6	4.0	9
12	5.0	6	4.8	9	4.8	6	4.9	9	4.8	6	5.0	9	4.5	6	4.0	9
13	4.7	7	4.6	10	3.7	7	4.5	10	4.8	7	4.3	9	4.7	7	4.3	8
14	4.3	6	4.4	10	4.1	7	4.0	10	4.2	7	4.7	10	4.2	6	3.8	10
15	4.7	6	4.6	8	4.0	6	4.6	8	4.7	6	4.3	7	4.5	6	4.3	8
16	4.8	6	4.8	8	4.8	6	4.9	8	4.5	6	4.4	7	4.7	6	4.5	8
17	4.0	7	4.9	9	4.1	7	4.7	9	3.5	7	4.8	8	4.0	7	3.9	9
18	4.4	7	4.8	10	4.7	6	4.6	10	4.8	5	4.8	9	3.9	7	4.3	10
19	4.5	6	4.9	8	4.8	5	4.8	8	4.3	6	4.6	7	4.3	6	3.9	8
20	4.0	6	4.8	8	4.2	6	3.1	8	3.4	7	4.4	7	4.0	6	4.3	8
21	4.3	7	4.8	9	4.3	6	4.7	9	4.3	7	4.7	9	3.9	7	4.1	9
22	4.6	7	4.6	9	4.4	6	4.3	9	3.8	6	4.3	9	3.7	6	3.8	9
23	5.0	6	4.6	10	4.8	6	4.7	10	5.0	6	4.9	9	5.0	6	4.4	10
24	5.0	6	4.8	10	4.7	6	4.7	10	5.0	6	4.8	9	4.5	6	4.5	10
25	4.3	6	4.9	8	4.6	7	4.5	8	4.0	7	5.0	7	3.1	7	4.3	8
26	4.6	7	5.0	8	4.4	7	5.0	8	4.8	7	4.9	7	4.7	7	4.6	8
27	4.7	6	4.8	9	4.9	7	4.9	9	4.6	7	4.4	9	4.7	7	3.9	9
28	4.6	7	4.2	9	4.1	7	4.3	9	4.6	7	3.7	9	4.5	6	3.6	9
29	4.2	7	4.5	10	3.8	7	4.3	10	3.6	7	4.3	9	4.4	7	4.3	10
30	4.2	7	4.2	9	4.5	7	3.7	9	4.6	7	4.6	9	4.0	7	4.1	9
31	4.3	6	4.6	8	3.8	6	4.5	8	3.8	6	4.4	7	4.3	6	4.1	8

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	SC		TC		SR		TR		SA		TA		SD		TD	
ITEM #	*M*	*N*	*M*	*N*	*M*	*N*	*M*	*N*	*M*	*N*	*M*	*N*	*M*	*N*	*M*	N
32	4.7	6	4.8	8	4.2	6	4.9	8	4.7	7	4.9	7	4.2	6	4.8	8
33	3.1	7	4.7	9	4.5	6	4.4	9	3.7	6	4.0	9	2.9	7	3.3	9
34	3.9	7	4.8	9	4.9	7	4.6	9	4.9	7	4.8	9	3.9	7	4.0	9
35	4.6	7	4.3	10	4.3	7	3.9	10	4.6	7	4.0	9	4.7	7	3.6	10
36	4.5	6	4.2	10	5.0	6	4.9	10	4.3	6	4.3	9	4.7	6	3.8	10
37	4.7	7	4.8	8	4.9	7	4.9	8	4.6	7	4.6	7	4.0	7	3.9	8
38	5.0	7	5.0	8	5.0	7	5.0	8	4.8	7	5.0	7	4.7	7	4.9	8
39	5.0	6	4.8	9	4.8	6	4.8	9	5.0	6	4.7	9	4.8	6	4.4	9
40	4.7	7	4.6	10	4.6	6	4.1	10	4.4	7	4.4	9	3.9	7	3.7	10
41	4.7	7	4.3	10	4.8	7	4.5	10	4.1	7	4.1	9	4.1	7	4.3	9
42	4.7	6	4.8	8	4.5	6	4.9	8	4.3	6	4.1	7	4.5	6	3.8	8
43	5.0	7	4.8	8	5.0	6	4.8	8	5.0	6	4.3	7	4.8	6	4.5	8
44	4.4	7	4.9	9	4.9	7	4.6	9	4.4	7	4.7	9	4.2	7	3.7	9
45	4.9	7	4.9	9	4.5	7	4.8	9	4.2	7	4.4	9	4.9	7	3.9	9
46	4.7	7	4.8	9	4.4	7	4.6	9	4.7	7	4.6	9	4.9	7	4.7	9
47	4.5	6	4.3	8	4.5	6	4.3	8	4.5	6	3.9	8	4.2	6	3.5	8
48	4.6	7	4.3	10	4.6	7	4.1	10	4.6	7	3.8	9	3.8	6	3.3	7
49	4.4	7	4.2	10	4.6	7	3.9	10	4.0	7	3.3	9	3.4	7	3.4	10
50	4.2	5	4.4	8	3.0	6	3.9	8	3.2	5	4.2	6	4.2	5	3.5	8
51	5.0	7	4.6	8	4.9	7	4.2	9	5.0	6	4.2	9	4.1	6	4.3	6
52	4.9	7	4.3	8	4.4	7	3.9	9	4.4	7	3.9	9	4.4	7	3.8	8
53	4.7	6	4.8	9	4.8	5	4.2	9	4.8	6	4.6	8	4.3	6	3.9	9
54	4.5	6	4.7	10	5.0	6	4.7	10	4.8	6	4.7	9	4.8	6	3.9	10
55	4.6	7	4.4	8	4.6	7	4.5	8	5.0	7	3.4	7	4.4	7	4.0	8
56	4.9	7	5.0	8	4.9	7	5.0	8	4.4	7	4.9	7	4.7	6	4.9	8
57	3.9	7	4.8	8	4.6	7	4.8	8	4.4	7	4.3	7	4.8	6	4.1	8
58	4.5	4	3.7	6	4.0	4	3.1	7	4.3	4	3.4	5	3.5	4	3.4	7
59	4.4	7	4.7	9	5.0	7	4.7	9	5.0	7	4.4	9	5.0	7	3.4	9
60	4.4	7	4.9	9	4.7	7	4.9	9	4.6	7	4.9	9	4.3	6	4.6	9
61	4.3	7	5.0	9	4.4	7	5.0	9	4.6	5	4.8	9	3.8	6	4.7	9
62	4.3	7	4.9	9	4.3	7	4.9	9	3.7	7	4.1	9	3.7	7	4.1	9
63	5.0	7	4.4	9	5.0	7	4.1	9	4.4	7	4.0	9	4.1	7	3.2	9
64	4.3	6	4.6	10	4.3	6	4.2	10	4.3	6	4.1	9	4.2	5	3.4	10
65	4.7	7	4.6	10	4.3	7	4.2	10	4.8	7	4.1	9	4.1	6	4.2	10
66	4.7	7	4.9	8	4.9	6	4.9	8	4.4	7	5.0	7	3.8	7	5.0	8
67	4.4	7	4.6	8	4.4	7	4.5	8	4.3	7	4.3	7	4.3	7	4.6	8
68	4.7	7	4.8	9	4.7	7	4.6	9	4.6	7	4.4	9	4.2	6	3.9	9
69	4.9	7	5.0	9	4.6	7	4.9	9	4.7	7	5.0	9	4.2	5	4.5	6
70	4.9	7	4.8	9	4.4	7	4.3	9	4.4	7	4.3	9	4.4	7	4.0	9
71	4.7	7	4.4	9	4.3	7	4.4	9	4.3	7	4.4	9	4.1	7	4.1	9
72	4.2	6	4.2	10	4.3	7	3.8	10	3.4	7	3.6	9	3.9	5	3.9	9
73	4.9	7	4.5	10	4.7	7	4.5	10	4.7	7	4.1	9	5.0	6	3.8	9

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ITEM #	*M*	*N*	*M*	*N*	*M*	*N*	*M*	*N*	*M*	*N*	*M*	*N*	*M*	*N*	*M*	N
74	4.7	7	4.7	10	5.0	7	4.5	10	5.0	7	4.8	9	4.6	7	4.3	10
75	5.0	6	4.6	10	5.0	7	4.5	10	4.8	6	4.6	9	4.1	7	4.2	10
76	5.0	7	4.8	8	4.7	7	4.8	8	5.0	7	4.3	7	5.0	6	4.1	7
77	4.7	7	4.0	8	4.6	7	4.5	8	4.7	7	4.1	7	4.8	6	4.1	8
78	4.9	7	4.7	9	4.7	7	4.7	9	4.7	7	4.9	9	4.0	6	4.0	7
79	4.4	7	4.4	9	4.1	7	3.9	9	3.5	6	3.8	9	3.5	6	3.1	9
80	4.9	7	4.8	10	5.0	7	4.9	10	4.8	6	4.7	9	4.8	6	4.3	10
81	4.9	7	4.7	9	4.5	7	4.4	9	4.6	7	4.6	8	4.8	6	4.1	9
82	4.9	7	4.4	10	4.6	7	4.0	10	4.7	7	4.4	9	4.3	7	3.8	10
83	4.8	6	4.8	10	4.7	7	4.4	10	4.9	7	4.3	9	4.7	7	4.0	10
84	4.4	7	4.9	8	4.1	7	3.9	8	4.5	6	4.6	7	4.6	5	4.8	8
85	4.9	7	5.0	8	4.9	7	4.6	8	4.6	7	4.7	7	4.9	7	4.6	8
86	4.6	7	4.7	9	4.7	7	4.3	9	5.0	7	4.8	9	4.3	7	4.6	9
87	4.9	7	5.0	9	4.9	7	4.9	9	4.7	7	4.9	9	4.3	7	4.6	9
88	4.3	6	4.6	10	3.8	6	3.7	10	4.5	6	4.0	9	4.7	6	3.5	10
89	4.7	6	4.4	10	3.7	6	3.8	9	4.0	6	4.1	9	4.3	6	3.5	10
90	4.8	5	4.8	8	4.2	6	4.6	8	4.8	6	4.9	7	4.5	5	4.5	8
91	4.2	6	4.6	10	4.0	7	4.2	10	4.4	7	4.8	9	4.7	6	4.3	10
92	4.4	7	4.4	10	4.1	7	4.5	10	4.1	7	4.4	9	3.6	6	3.9	9
93	4.8	6	4.6	8	3.8	6	4.4	8	4.7	6	4.3	7	4.5	6	4.0	8
94	4.6	7	4.1	9	4.3	7	4.4	9	4.6	7	4.4	8	4.1	7	3.8	8
95	4.9	7	4.5	10	4.8	6	4.6	10	4.4	7	4.4	9	4.3	7	4.2	10
96	4.9	7	4.8	8	4.7	7	4.8	8	4.9	7	4.3	7	4.7	7	4.3	8
97	5.0	7	4.8	8	4.4	7	4.6	8	4.4	7	4.7	7	4.9	7	4.5	8
98	4.7	7	5.0	9	4.6	7	5.0	9	4.0	7	4.7	9	3.8	5	4.2	9
99	4.7	7	4.9	9	4.7	7	4.4	9	4.4	7	4.4	9	4.2	6	3.7	9
100	4.3	6	4.4	10	4.8	6	4.3	10	4.2	6	4.0	9	5.0	6	3.7	10
101	4.7	6	4.5	10	4.5	6	4.4	10	4.7	6	4.4	9	4.3	7	4.3	10
102	5.0	4	4.8	5	4.5	4	4.8	4	4.8	4	4.5	4	5.0	4	4.3	4
103a	3.7	7	4.8	9	4.1	7	4.8	10								
103b	3.9	7	4.7	9	4.4	7	4.3	9								
104	3.6	7	4.6	9	4.7	6	4.6	9								
105	5.0	6	5.0	8	5.0	6	5.0	7								
106a	4.8	6	4.9	8	5.0	6	4.7	7								
106b	4.7	6	4.8	8	4.3	6	4.4	7								
107a	3.3	7	4.8	8	4.3	6	5.0	8								
107b	3.3	7	4.0	8	4.3	6	4.4	8								
108a	4.3	7	4.9	8	4.3	6	5.0	8								
108b	5.0	6	4.8	9	5.0	6	4.9	9								
109a	5.0	6	4.4	9	5.0	6	4.8	9								
109b	4.2	5	4.4	8	4.0	4	4.8	8								

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M = Mean *N* = Number of respondents 1 = lowest rating 5 = highest rating

	SC		TC		SR		TR		SA		TA		SD		TD	
ITEM #	***M***	***N***	***M***	***N***	***M***	***N***	***M***	***N***								
110a	4.2	6	4.8	10	4.5	6	4.6	10								
110b	4.3	6	4.4	10	4.5	6	4.9	10								
111	4.3	6	4.4	10	4.8	6	4.8	10								
112a	5.0	7	4.6	10	5.0	7	4.8	10								
112b	4.9	7	4.7	10	4.7	7	4.7	10								
113	5.0	7	4.6	10	5.0	7	4.8	10								
114	5.0	7	4.6	8	4.8	6	4.7	7								
115a	4.0	7	4.9	7	4.8	6	4.5	6								
115b	4.7	7	4.8	8	5.0	6	4.6	7								
116	4.9	7	4.8	8	4.6	7	4.9	7								
117a	4.9	7	4.8	8	4.9	7	4.9	7								
117b	4.9	7	4.6	8	4.1	7	4.7	7								
118	5.0	7	5.0	9	4.9	7	4.9	9								
119	5.0	6	5.0	9	4.8	6	4.6	9								
120a	5.0	6	4.8	9	4.7	6	4.0	9								
120b	4.8	7	5.0	9	4.5	6	4.8	9								
121a	4.8	7	4.9	9	4.8	6	5.0	9								
121b	3.9	6	4.8	9	3.8	5	4.6	9								
122	4.6	7	5.0	8	4.9	7	5.0	8								
123	4.9	7	5.0	8	5.0	7	4.9	8								
124	5.0	7	4.9	8	5.0	7	5.0	8								
125	4.9	7	4.8	9	5.0	6	4.7	9								
126	4.6	7	4.8	9	3.9	6	4.5	9								
127	4.6	7	4.7	9	4.7	6	4.6	9								
128	4.9	7	3.9	8	4.7	7	4.9	7								
129	5.0	7	4.6	8	4.9	7	4.9	7								
130	5.0	7	4.4	8	4.9	7	4.4	7								
131	4.9	7	4.5	8	5.0	6	4.6	7								
132a	3.6	7	5.0	8	4.2	6	4.6	7								
132b	3.8	6	4.3	8	3.8	6	4.6	7								
133	5.0	6	4.9	9	5.0	6	4.8	9								
134	5.0	6	4.8	9	4.5	6	4.1	9								
135a	4.7	6	4.9	9	4.0	6	4.7	9								
135b	4.3	7	4.8	9	4.0	6	4.8	9								
136	4.1	7	4.2	9	3.2	6	3.9	9								
137	4.4	7	5.0	9	4.7	6	4.2	9								
138	5.0	7	4.8	8	4.4	7	4.4	7								
139	5.0	7	4.8	8	5.0	7	4.7	7								
140	5.0	7	4.8	8	4.4	7	4.9	7								
141a	4.1	7	4.6	8	4.3	6	4.9	8								
141b	4.2	7	4.9	9	4.7	6	4.8	9								

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	SC		TC		SR		TR		SA		TA		SD		TD	
ITEM #	*M*	*N*	*M*	*N*	*M*	*N*	*M*	*N*								
142	4.3	7	4.9	9	3.8	6	5.0	9								
143	5.0	6	5.0	8	5.0	6	4.9	8								
144	5.0	6	4.9	9	4.0	5	4.2	9								
145	4.7	7	4.7	9	4.6	7	5.0	9								
146	4.7	6	4.7	9	4.2	5	4.0	9								
147	4.8	6	4.2	9	4.6	5	4.0	9								
148	4.8	6	4.3	9	4.8	4	4.0	9								
149	4.7	7	4.9	7	3.7	7	4.3	7								
150	4.7	6	4.6	8	4.2	6	4.6	7								
151	5.0	6	4.5	8	4.3	6	4.0	6								
152	4.0	6	4.4	9	3.8	5	4.3	9								
153	4.5	6	4.3	9	4.0	5	4.2	9								
154	4.3	6	4.1	9	4.2	5	4.7	9								
155	4.8	6	4.4	10	3.7	6	4.3	10								
156a	4.9	7	4.6	10	4.4	7	4.6	10								
156b	5.0	6	4.5	10	4.2	6	4.2	10								
157	4.7	6	4.6	8	4.2	5	4.9	7								
158	4.2	6	4.7	7	3.4	5	4.9	7								
159	4.3	6	4.6	7	4.0	5	4.7	7								
160	5.0	6	4.8	9	4.5	6	4.8	9								
161	4.7	6	4.1	9	4.0	6	4.1	9								
162	4.2	5	4.6	9	4.2	5	4.4	9								
163	4.9	5	4.1	9	4.8	4	4.1	9								
164	3.4	6	4.8	9	4.6	5	4.7	9								
165	4.6	6	4.1	8	3.8	5	4.0	8								
166	4.4	7	5.0	7	4.3	7	4.8	6								
167	4.4	5	4.7	7	4.0	5	4.6	7								
168	4.7	6	4.6	9	4.4	5	4.4	9								
169	5.0	5	4.8	9	5.0	5	4.8	9								
170	4.3	6	4.7	9	5.0	5	4.8	9								
171	5.0	7	4.8	8	4.9	5	4.3	7								
172	5.0	7	4.5	8	5.0	7	4.9	7								
173	5.0	7	4.8	8	5.0	7	4.7	7								
174	4.3	6	4.9	9	4.8	5	4.9	9								
175	5.0	5	4.9	9	5.0	5	5.0	9								
176	4.1	6	4.9	9	4.2	5	4.9	9								
177	5.0	7	4.6	9	4.6	7	4.6	9								
178	4.5	6	4.4	8	4.2	6	4.5	8								
179	5.0	7	4.9	9	4.3	7	4.8	9								
180	4.2	7	4.7	7	4.3	6	4.7	6								
181a	4.0	6	4.6	8	3.8	5	4.7	6								
181b	4.4	7	4.7	7	4.7	6	4.6	7								

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ITEM #	SC		TC		SR		TR		SA		TA		SD		TD	
182	5.0	7	5.0	9	4.6	7	4.9	9								
183	4.9	7	4.4	9	5.0	7	4.9	9								
184	4.7	7	4.4	9	4.3	7	4.7	9								
185a	5.0	5	4.6	9	5.0	5	4.6	9								
185b	5.0	5	4.6	9	4.6	5	4.1	9								
186a	4.8	7	4.8	9	4.9	6	4.1	9								
186b	4.4	6	4.5	8	4.4	5	4.1	9								
187	4.7	7	4.9	8	4.7	6	3.8	8								
188	4.9	7	4.8	8	4.3	7	4.7	7								
189	4.7	7	5.0	8	4.9	7	4.9	7								
190a	4.9	7	4.4	8	5.0	7	4.7	7								
190b	4.8	6	4.8	9	4.8	5	4.9	9								
191	4.9	6	4.6	9	5.0	5	4.9	9								
192	4.8	6	4.9	9	5.0	5	5.0	9								
193	5.0	7	4.6	9	5.0	7	4.9	9								
194a	4.9	7	4.9	9	5.0	7	4.9	9								
194b	4.7	7	3.9	8	4.6	7	4.6	8								
195	4.4	7	5.0	8	4.3	6	4.9	7								
196	4.8	7	4.9	8	4.8	6	4.7	7								
197	4.1	6	5.0	8	4.0	5	4.7	7								
198	4.6	7	5.0	9	4.4	7	5.0	9								

Appendix E

Item Analysis Pilot (May 1995)

Letter, instructions, and definition of biodiversity sent to May 1995 piloting teachers

Dear piloting teacher,

May 10, 1995

Thank you very much for agreeing to pilot the "Windows on the Wild" Biodiversity Survey. We realize that this is a very busy time of the school year and appreciate your willingness to participate.

As you know, "Windows on the Wild" is World Wildlife Fund's (WWF) biodiversity education program. WWF is currently developing biodiversity curriculum materials for middle school students and educators. We are also interested in finding out what middle schoolers know about biodiversity issues and how their knowledge, skills, and attitudes change after taking part in biodiversity education activities. Over the past six months we have been working with the Wisconsin Center for Environmental Education (WCEE) at the University of Wisconsin-Stevens Point to develop an assessment instrument, or survey, that will help us evaluate students in some of these aspects.

WCEE compiled a list of questions that could be used in the survey. Educators from around the country helped to evaluate each of the questions (you may have been one of the reviewers). Using the feedback from reviewers, WCEE revised many of the questions and eliminated others before designing the enclosed survey. We will use the feedback we get from you and your students on this pilot to further refine the items for a final instrument that will be developed by WCEE this summer. The instrument will then be used along with "Windows on the Wild" curriculum materials next fall.

We ask that you tell your students they are participating in a survey about what middle schoolers know and feel about biodiversity. (This is explained in more detail in the instructions.) Please give the survey to one of your classes during a single class period. You will need 5-10 minutes to give directions and 40 minutes for the students to complete the survey. We anticipate that many students may be unfamiliar with the term "biodiversity" and therefore ask that you write the definition on the board for their reference while doing the survey (copies are also provided for you to distribute). Other than the definition, you do not need to provide other background information.

We have enclosed 35 student surveys, 35 answer sheets, instructions, and a postage-paid envelope for returning the completed information back to us. If any of these items are missing, let us know as soon as possible.

Before returning the materials, please make sure your classroom code is on each of the answer sheets (your code is included in the instructions), and answer and return the questions on the sheet labeled "To the Administering Teacher." Both are important for our analysis. Please return this sheet, the student answer sheets, and a copy of the survey with your comments by **Monday, June 5**. If this date is a problem or if you have any questions at all, call AnneMarie VanDam at 715-346-4950.

I also want to remind you that we are looking for teachers to pilot our curriculum materials in the fall. If you are interested in taking part, please call Margaret Pennock at 202-778-9503. We'll probably check in with you at the start of the school year to see what your schedule looks like. Again, thank you for your help with this phase of what we believe to be a very timely and important effort in environmental education. Have a great summer!

Sincerely,

Judy Braus
Director Environmental Education

To the Administering Teacher

Please answer the following questions providing us with important information for the analysis of the surveys. Return this form with the student answer sheets. Thanks!

1. What size community do most of the students live in? (please circle only one)

   a) small (population of community is less than 20,000)
   b) medium (population of community is 20,000 to 100,000)
   c) large (population of community is more than 100,000)

2. How would you describe the students' knowledge of biodiversity based on their exposure in school?

   a) the students have had **a lot** of exposure to biodiversity and related issues
   b) the students have been exposed **somewhat** to biodiversity and related issues
   c) the students have received **little** exposure to biodiversity and related issues

Comments:____
____
____

3. We are trying to determine if students who are identified by their teachers as being environmentally knowledgeable and sensitive do better on this survey than other students. Please list students in this class by first name and last initial who you would say are particularly knowledgeable and concerned about the environment and environmental issues. These students may not necessarily be the students who are the highest achievers. Your list will be kept anonymous -- the identified students will be scored as a group and not as individuals. (If more than ten, add others on the back of this sheet.)

1) ____________________________
2) ____________________________
3) ____________________________
4) ____________________________
5) ____________________________
6) ____________________________
7) ____________________________
8) ____________________________
9) ____________________________
10) ___________________________

4. Please look at one of the surveys and write your own comments about the items and format. If possible, make notes about difficulties that students had on particular items as well as the amount of time it took for them to complete the survey and return this with the answer sheets.

Thanks again for your input!!

Definition of "Biodiversity" provided to students during May 1995 piloting and December 1995 piloting:

> **"Biodiversity is another word for the variety of life on Earth. It includes the different kinds of animals, plants, and other organisms, and the variety of ecosystems in which they live."**

May 1995 Pilots A, B, and C Cognitive Item Pool and Results of Item Analysis

Corr. Item Corr. = corrected item correlation; **Alpha if item del.** = subscale alpha if item was deleted; **Disc. Index** = discrimination index; **Difficulty Fact.** = difficulty factor; **upp. quar. (N)** = number in upper quartile of respondents; **low. quart.** = number in lower quartile of respondents; **Total %** = Percent of students who chose each response. **BL** = Bloom's Taxonomy of Cognitive Objectives (K = Knowledge; C = Comprehension; An = Analysis; Ap = Application; S = Synthesis; E = Evaluation.) *(NOTE: Statistics do not add up to 100 % because missing responses are not included.*

Item by Pilot	Subscale Alpha Pilot A = .8820 Pilot B = .8359 Pilot C = .8363	Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
	I. COGNITIVE OUTCOMES: **A. Knowledge of Ecological Principles and Processes Related to Biodiversity** **1. Three levels of Biodiversity**								
A **(39)**	Biodiversity includes:								**K**
	a) genetic diversity.	.4111	.8786	-0.1	0.798	1	5	4	
	b) species diversity.			-0.1		1	6	8	
	c) ecosystem diversity.			-0.2		0	10	8	
	d) **all of the above.**			0.4		42	23	80	
B **(39)**	For the next three questions, match the phrase with the answer set (a, b, or c) that most correctly describes it. Use each answer set only once. ___ genetic diversity								**C**
	a) mountains, deserts, rain forests, grasslands	.4435	.8281	-0.2	0.704	1	11	13	
	b) hawk, salamander, black bear, mosquito			-0.2		2	12	14	
	c) **red potatoes, banana potatoes, black finger**			0.6		38	14	70	
	potatoes			-0.1			4	3	

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
B (40)	For the next three questions, match the phrase with the answer set (a, b, or c) that most correctly describes it. Use each answer set only once. ___ ecosystem diversity **a) mountains, deserts, rain forests, grasslands** b) hawk, salamander, black bear, mosquito c) red potatoes, banana potatoes, black finger potatoes	.4135	.8292	0.7 -0.3 -0.3	0.716	40 1 0	13 12 11	72 12 13	C
B (41)	For the next three questions, match the phrase with the answer set (a, b, or c) that most correctly describes it. Use each answer set only once. ___ species diversity a) mountains, deserts, rain forests, grasslands **b) hawk, salamander, black bear, mosquito** c) red potatoes, banana potatoes, black finger potatoes	.3759	.8303	-0.3 0.6 -0.1	0.728	0 38 3	13 15 9	14 73 11	C
	IA1a. Genetic Diversity								
A (40)	Which of the following best represents examples of genetic diversity? **a) brown fur, black fur, thick fur, long fur** b) polar bear, penguin, beetle, rose c) forest, ocean, mountain, field d) owl, hawk, hummingbird, duck	.2243	.8830	0.4 0.0 -0.2 -0.2	0.509	30 8 2 4	12 8 12 12	51 17 14 18	An

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
A (45)	**Potatoes are grown all over the world. The reason that one species of potato looks very different from another is because of a difference in:**								**Ap**
	a) their taste.	.4387	.8779	-0.1	0.682	0	5	4	
	b) their quality.			-0.2		0	7	9	
	c) **their genes.**			0.6		43	16	68	
	d) their water content.			-0.3		1	14	17	
B (42)	**Grevy's zebra is an endangered species in Africa. The stripes on one Grevy's zebra can look very different from the stripes of another Grevy's zebra. This is a result of ________________ diversity.**								**C**
	a) ecosystem	.1789	.8371	-0.1	0.494	0	3	3	
	b) **genetic**			0.4		30	14	49	
	c) species			-0.2		3	13	28	
	d) all three			0.0		8	8	17	
C (40)	**The different colors, textures, and tastes of varieties of plants such as potatoes is due to __________ diversity.**								**C**
	a) ecosystem	.2991	.8333	-0.1	0.423	8	12	30	
	b) **genetic**			0.4		23	8	42	
	c) population			-0.1		2	4	8	
	d) habitat			-0.1		3	7	16	

C (64)	Crop breeders rely on a diversity of corn species to create new varieties that will resist pests and diseases. This is an example of the importance of: a) **genetic diversity.** b) ecosystem diversity. c) insect pests. d) all of the above	.1781	.8367	0.2 -0.1 -0.1 0.4	0.211	12 7 2 15	4 11 5 2	21 23 15 25	Ap
	IA1b. Species Diversity	**Corr. Item Corr.**	**Alpha if Item Deleted**	**Disc. Index**	**Diff. Fact.**	**upp. quar. (N)**	**low. quar. (N)**	**To-tal %**	**BL**
A (41)	Of the groups below, which has been identified by scientists as having the greatest number of species? a) fish b) birds c) **insects** d) mammals	.2842	.8812	-0.0 -0.0 0.3 -0.2	0.757	0 0 41 3	2 1 28 11	3 2 76 18	K
B (44)	According to scientists, which group of living things has the largest number of identified species? a) mammals b) plants c) birds d) **insects**	.1737	.8372	-0.1 -0.0 -0.1 0.4	0.395	5 10 0 26	11 12 5 10	25 28 6 40	K

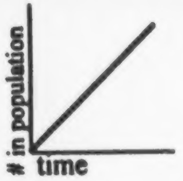
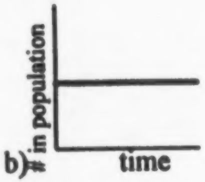
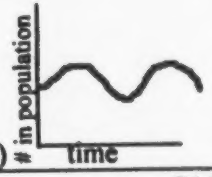
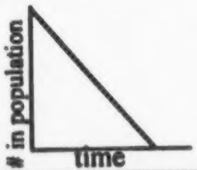
		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
A (62)	Approximately 1.5 million species on Earth have been identified by scientists. Most scientists feel that this number:								K
	a) is close to the true number of species that exist.	.4850	.8770	-0.2	0.699	2	9	13	
	b) is too high, and many species have been incorrectly identified.			-0.3		0	14	10	
	c) **could only be a small part of the total number that exist.**			0.7		42	12	70	
	d) shouldn't include microscopic organisms.			-0.2		0	7	5	
B (43)	Of the choices below, the regions of the world that contain the greatest species diversity are:								K
	a) tropical rain forests.	.2900	.8330	0.3	0.852	40	26	85	
	b) grasslands.			-0.0		1	2	4	
	c) deserts.			-0.1		0	5	4	
	d) wetlands.			-0.1		0	5	5	
C (41)	Which of the following statements is true about the diversity of species?								K
	a) Scientists know how many species there are in the world.	.3497	.8316	-0.1	0.465	1	6	10	
	b) Mammals and birds make up the largest number of species in the world.			0.0		13	13	32	
	c) **Warm, wet regions of the world contain more diversity of species than cold, dry regions.**			0.4		22	6	46	
	d) Oceans and other aquatic ecosystems do not contain nearly as many species as land ecosystems.			-0.1		0	3	6	

	IA1c. Ecosystem Diversity	**Corr. Item Corr.**	**Alpha if Item Deleted**	**Disc. Index**	**Diff. Fact.**	**upp. quar. (N)**	**low. quar. (N)**	**To-tal %**	**BL**
A (42)	**Which of the following describes a community of living things that interact with each other and with the nonliving parts of the environment?**								**K**
	a) **ecosystem**	.4155	.8785	0.6	0.595	41	13	60	
	b) biome			-0.2		1	8	12	
	c) biodiversity			-0.3		2	13	16	
	d) population			-0.2		0	9	12	
B (45)	**Which of the following statements is true about an ecosystem?**								**C**
	a) It is at least several acres in size.	.4421	.8289	-0.1	0.815	0	5	4	
	b) It includes only living things.			-0.2		0	7	8	
	c) **It includes both living and nonliving things.**			0.5		41	21	81	
	d) It does not include things such as energy or nutrient cycles.			-0.1		0	5	5	
C (42)	Which of the following best describes ecosystem diversity?								**E**
	a) **oceans, wetlands, lakes, rivers**	.2710	.8342	0.5	0.528	26	8	53	
	b) eagle, river, otter, lake			-0.0		4	5	16	
	c) white oak, red oak, black oak, pin oak			-0.1		3	8	11	
	d) ocean, shark, starfish, plankton			-0.1		3	7	13	

C (44)	Which of the following is not an example of an ecosystem? a) a tundra b) **a plant** c) a coral reef d) a wetland	.2652	.8344	-0.1 0.4 0.0 -0.1	0.380	7 22 7 0	9 6 6 5	27 38 20 8	Ap
	IA2. Ecological Factors Affecting Biodiversity **IA2a. Ecosystem structure and function**	**Corr. Item Corr.**	**Alpha if Item Deleted**	**Disc. Index**	**Diff. Fact.**	**upp. quar. (N)**	**low. quar. (N)**	**To-tal %**	**BL**
A (44)	Every species needs all of the following except: a) food b) **trees** c) water d) area/space	.3870	.8792	-0.0 0.5 -0.2 -0.0	0.526	0 36 0 7	2 12 9 16	3 53 8 31	Ap
B (46)	The place where a plant or animal lives is called its: a) range. b) territory. c) **habitat.** d) community.	.3748	.8306	-0.0 -0.2 0.5 -0.1	0.815	1 1 39 0	3 11 20 4	2 9 81 5	K
B (47)	A group of organisms of the same species living together in the same area is called a(n): **a) population.** b) ecosystem. c) community. d) niche.	.0981	.8426	-0.1 -0.1 0.2 -0.0	0.179	6 8 18 8	10 12 8 8	18 25 33 20	K

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
B (48)	Everything used by organisms in an ecosystem is recycled except: a) air. b) water. c) food wastes. d) **energy.**	.3624	.8307	-0.2 0.0 -0.2 0.5	0.444	3 3 6 29	12 2 13 10	19 10 25 44	C
C (45)	The area where an animal or plant lives and finds water, sunlight, shelter, living space, nutrients, and other essentials for survival is called its: a) **habitat.** b) feeding level. c) niche. d) adaptation.	.4592	.8282	0.7 -0.1 -0.2 -0.1	0.641	34 1 1 0	9 6 7 5	64 10 12 8	K
C (46)	A small bird eats a butterfly that had been eating nectar from a flower. Then the bird is eaten by a hawk. This is an example of: a) mutualism. b) **a food chain.** c) competition. d) survival of the fittest.	.3918	.8306	-0.2 0.6 -0.1 -0.1	0.725	1 35 0 0	7 14 3 3	11 73 4 7	C

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
C (49)	The first link in a food chain is a:								K
	a) consumer.	.1700	.8374	-0.1	0.317	4	7	16	
	b) producer.			0.3		16	6	32	
	c) decomposer.			0.0		6	6	23	
	d) host.			0.1		10	5	21	
	IA2b. Ecosystem change								
A (46)	Which of the following statements represents the population trend for most species?								C
	a) the population goes up and down			0.3		28	16	52	
	b) the population stays the same	.1322	.8851	-0.0		3	4	7	
	c) the population increases			-0.2	0.520	6	13	20	
	d) the population decreases			-0.0		7	8	19	
B (49)	When a natural disturbance (such as a flood or forest fire) occurs in an ecosystem, the species in the region:								Ap
	a) would only be affected for a short time.	.3681	.8305	-0.1	0.562	2	7	13	
	b) could recover if enough plants, animals, and other organisms survived.			0.6		39	13	56	
	c) are usually not affected.			-0.1		0	6	7	
	d) are likely to become endangered.			-0.2		0	9	20	

C (47)	Which of the following graphs represents the typical population trend of most species? a)  b)  c)  d) 	.2105	.8363	-0.2 -0.1 0.4 0.2	0.458	2 2 22 10	8 6 9 2	17 11 46 16	C
	IA2c. Evolution and extinction	Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	Total %	BL
A (56)	If a giraffe was removed from its home in Africa and released into the state of Texas, the giraffe would be called a(n) ________________ species. a) **exotic** b) endangered c) native d) threatened	.4639	.8773	0.7 -0.2 -0.4 -0.1	0.538	41 0 0 3	10 10 16 6	54 10 21 14	Ap
A (47)	When a species is endangered, the species: a) is no longer found anywhere in the world. b) is only able to survive in tropical climates. c) **may become extinct.** d) is no longer found in the wild.	.5799	.8759	-0.2 -0.0 0.5 -0.2	0.861	0 0 44 0	10 1 23 8	7 1 86 5	C

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
A (48)	It is difficult to know exactly how many plants and animals on Earth have become extinct because:								**C**
	a) many species are not yet identified.	.4811	.8769	-0.2	0.624	3	11	19	
	b) some species may appear to be extinct, but are actually still living.			-0.2		0	7	9	
	c) fossil records may not show all species that have already gone extinct.			-0.2		0	9	9	
	d) all of the above			0.6		41	15	62	
B (50)	When a species dies out, it becomes:								**K**
	a) vulnerable.	.3991	.8310	-0.1	0.870	0	4	10	
	b) endangered.			-0.1		0	5	6	
	c) **extinct.**			0.4		41	24	73	
	d) threatened.			-0.0		0	2	6	
C (50)	Extinct means that the species:								**C**
	a) **no longer exists.**	.6230	.8227	0.9	0.620	36	5	62	
	b) is seriously threatened.			-0.1		0	4	11	
	c) is found only in certain habitats.			-0.3		0	10	11	
	d) is rare.			-0.1		0	5	7	
C (51)	Biodiversity is probably **not** decreased in the **long term** by:								**Ap**
	a) pollution and loss of habitat.	.0800	.8394	-0.2	0.211	0	6	15	
	b) the introduction of new or exotic species.			0.4		20	7	32	
	c) **species becoming extinct through evolution.**			0.2		11	4	21	
	d) human population growth.			-0.0		5	6	22	

C (53)	Which of the following phrases is correct? Choose one: a) Extinction is not a natural process and is only occurring today because of human carelessness. b) **Although extinction is a natural process, many people are concerned because the rate of extinction today is very high.** c) When an animal becomes extinct, this means that it was not meant to live in today's environment. d) When an animal becomes extinct, it is very close to disappearing from the Earth forever.	.3478	.8317	0.1 0.6 -0.3 -0.0	0.401	7 27 0 1	5 6 10 2	23 40 15 8	C
	IA3. The Ecological Value of Biodiversity **IA3a. Genetic input**	**Corr. Item Corr.**	**Alpha if Item Deleted**	**Disc. Index**	**Diff. Fact.**	**upp. quar. (N)**	**low. quar. (N)**	**To-tal %**	**BL**
A (49)	The greater the diversity within an ecosystem, the better the chances are that the ecosystem: a) is very small in size. b) **can recover from a disaster such as a volcano or flood.** c) will collapse if there is a disaster such as a volcano or flood. d) contains more animals than plants.	.4535	.8776	-0.1 0.6 -0.2 -0.1	0.503	0 34 5 5	6 9 15 11	6 50 17 24	An
C (54)	Sometimes a species goes through genetic changes over time to adjust to new conditions in its environment. This is called: a) tolerance. b) production. c) **adaptation.** d) isolation.	.5004	.8265	-0.1 -0.2 0.8 -0.1	0.521	1 2 33 0	6 8 4 4	13 15 52 6	K

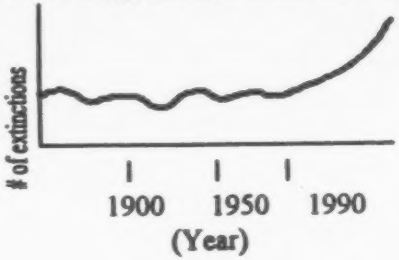
	IA3b. Contribution to ecosystem functioning and interdependence	**Corr. Item Corr.**	**Alpha if Item Deleted**	**Disc. Index**	**Diff. Fact.**	**upp. quar. (N)**	**low. quar. (N)**	**To-tal %**	**BL**
A (50)	Recently researchers have noticed that the world's frog populations have been declining. This concerns them because it could:								**K**
	a) lower oxygen supplies because frogs give off oxygen when they breathe.	.4769	.8770	-0.1	0.491	0	6	6	
	b) harm ecosystems because frogs are a part of many food webs.			-0.3		6	21	34	
	c) mean that air and water sources are polluted.			-0.2		1	10	10	
	d) b and c			0.7		37	5	49	
A (53)	In an ecosystem, a "keystone" species is usually:								**C**
	a) part of many food webs.	.4299	.8781	0.5	0.514	34	11	51	
	b) a reptile or a bird.			-0.2		0	10	10	
	c) only found in forests.			-0.3		0	13	16	
	d) a plant.			0.0		10	8	21	
B (52)	Honey guide birds alert and direct badgers to bee hives. The badgers break open the hives and feed on the honey. Then the honey guide bird eats what is left. Both species benefit. This kind of relationship is:								**Ap**
	a) an example of interdependence.	.3274	.8318	0.5	0.259	25	3	26	
	b) an example of parasitism.			-0.2		1	10	17	
	c) very rare.			-0.2		0	9	10	
	d) none of the above.			0.1		15	11	41	

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
B (53)	If there were no decomposers on Earth, what would happen?								Ap
	a) Nothing would change.	.5202	.8254	-0.2	0.636	0	8	9	
	b) Many human diseases would disappear.			-0.2		0	8	10	
	c) Many species would live longer.			-0.2		0	9	12	
	d) Dead plants and animals wouldn't become part of the soil.			0.8		41	8	64	
B (54)	Wolves often eat deer. Does this benefit the deer population?								Ap
	a) Yes, the wolves help keep the deer population size controlled.	.2313	.8353	-0.0	0.481	9	10	32	
	b) No. The deer population is only harmed.			-0.1		1	5	8	
	c) Yes, the wolves help keep the deer population strong since the fastest, most alert deer survive.			-0.1		0	6	6	
	d) both (a) and (c)			0.5		31	12	48	
C (55)	Many plants produce seeds within berries. When berries are eaten by birds, bears and other animals, the seeds are spread through the animals' droppings. This relationship is:								Ap
	a) only found with plants, mammals, and birds.	.2374	.8352	-0.1	0.282	7	9	23	
	b) found only on land and not in water environments.			-0.1		1	6	17	
	c) an example of the interdependence of organisms.			0.4		18	5	28	
	d) b and c			0.2		10	2	18	

C (65)	Most of the oxygen in the atmosphere comes from: a) water. **b) plants.** c) the soil. d) the sun.	.2834	.8338	0.0 0.7 -0.2 -0.2	0.493	4 29 1 2	4 4 7 7	10 49 11 16	K
	IA3c. Adaptation and resilience	**Corr. Item Corr.**	**Alpha if Item Deleted**	**Disc. Index**	**Diff. Fact.**	**upp. quar. (N)**	**low. quar. (N)**	**To-tal %**	**BL**
A (51)	Imagine that a fire recently swept through a large forest. If the diversity of forest life was high before the fire, after the fire it will: a) not be affected at all. b) never be able to recover. **c) have a better chance of recovering over time.** d) need human help to recover.	.3767	.8793	-0.1 -0.1 0.5 -0.3	0.636	0 1 41 2	5 6 17 14	4 6 64 25	An
B (51)	When a species adjusts over time to changes in its environment, this is called: a) tolerance. b) production. **c) adaptation.** d) isolation.	.4812	.8272	-0.1 -0.1 0.6 -0.2	0.728	0 0 41 0	4 6 15 9	10 6 73 6	K

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
B (55)	**When a seasonal change such as flooding or drought occurs in an ecosystem, the species that have lived there for years will most likely:**								**Ap**
	a) become very rare.	.1885	.8366	-0.2	0.358	1	8	9	
	b) recover from the change.			0.3		21	8	36	
	c) not be affected by the change at all.			-0.0		6	8	12	
	d) have a greater chance of becoming endangered.			0.1		13	10	38	
C (52)	The diversity of life in a region can usually recover after a natural disturbance (such as a flood or a forest fire) unless:								**Ap**
	a) there has been a serious loss of species.	.2578	.8347	-0.1	0.359	0	5	13	
	b) human actions interfere with the natural recovery process.			0.1		11	6	25	
	c) another disturbance happens before it can recover.			-0.1		2	7	15	
	d) all of the above			0.5		23	5	36	
C (56)	All of the following are considered “adaptations” except:								**C**
	a) a small body size in an individual animal due to a limited food supply.	.2761	.8338	0.4	0.232	18	2	23	
	b) waxy leaves that hold in moisture.			-0.0		8	9	27	
	c) changing color from season to season to help an animal blend in with its environment.			-0.1		2	5	17	
	d) different beak shapes and sizes found in different bird species.			0.1		8	6	19	

	IB. Knowledge of Problems and Issues Related to Biodiversity	**Corr. Item Corr.**	**Alpha if Item Deleted**	**Disc. Index**	**Diff. Fact.**	**upp. quar. (N)**	**low. quar. (N)**	**To-tal %**	**BL**
	IB1. Political, Economic, and Social Issues Affecting Biodiversity								
A (52)	Which of the following could be an economic problem resulting from biodiversity loss?								**C**
	a) The price of corn increases due to pest damage.	.4874	.8770	-0.1	0.757	0	6	5	
	b) A drug becomes harder to get because the plant it comes from is threatened.			-0.2		1	10	12	
	c) Overfishing causes people to lose their jobs.			-0.1		0	6	6	
	d) All of the above could be problems.			0.5		43	20	6	
A (54)	The rate of biodiversity loss is:								**K**
	a) slower today than it was 200 years ago.	.4516	.8776	-0.2	0.566	0	8	7	
	b) estimated to be increasing faster now than at any time since the extinction of dinosaurs.			0.6		40	13	57	
	c) staying about the same as it has for several hundred years.			-0.1		3	9	13	
	d) decreasing because evolution is happening more rapidly today.			-0.3		1	12	22	

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
B (56)	What does this curve suggest about extinctions in the last 50 years? 								
	a) Extinctions have been occurring at a normal and steady rate.	.5097	.8259	-0.1	0.673	0	6	9	
	b) Recent extinction rates have been occurring at a higher rate than ever before.			0.8		40	9	67	
	c) There are a lot more species in the world today than ever before.			-0.3		0	11	7	
	d) There are a lot fewer species in the world today than ever before.			-0.1		1	7	12	
C (57)	Managing for biodiversity means protecting ecosystems so that they support a diversity of species. Sometimes this creates conflicts with:								An
	a) the use of boats, cars, and other vehicles in protected areas.	.5651	.8242	-0.1	0.345	4	7	16	
	b) the types of jobs that are allowed in a certain area.			-0.1		2	6	18	
	c) the economy.			-0.2		0	7	16	
	d) all of the above			0.8		30	2	35	

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	lower quar. (N)	To-tal %	BL
	IB1a. Habitat Destruction								
A (55)	Why are so many species going extinct due to human changes to their habitat?								K
	a) The species are not as strong as they used to be.	.3358	.8801	-0.2	0.682	0	8	5	
	b) **The changes are happening too fast for species to adapt.**			0.5		39	15	68	
	c) There are too many species in the world today, so many need to go extinct.			-0.2		0	8	6	
	d) all of the above			-0.1		5	11	20	
B (57)	When a shopping mall is built in a wetland area, the most immediate threat to the wildlife that lives there is:								Ap
	a) **the loss of habitat.**	.3950	.8297	0.7	0.568	37	9	57	
	b) a decrease in species diversity.			-0.2		2	11	18	
	c) the possible pollution of nearby water supplies.			-0.1		2	7	14	
	d) an increasing number of people in the area.			-0.1		0	6	6	
C (58)	Which would probably cause the greatest long-term harm to the wildlife living near a farm?								An
	a) **Part of the farm is developed into a commercial shopping center.**	.4992	.8265	0.7	0.331	27	1	33	
	b) The area is hit with an early snow storm.			-0.3		1	11	20	
	c) Many people visit the farm to fish and go birdwatching.			-0.2		1	7	16	
	d) A nearby area is opened for deer hunting.			0.1		7	2	15	

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
C (60)	When an ecosystem is protected, this could affect the local economy because:								Ap
	a) jobs could be added or taken away.	.4536	.8281	0.1	0.345	6	3	20	
	b) more people might come to enjoy the scenery, increasing tourism.			-0.2		0	7	15	
	c) the area could become home to more species, increasing its value.			-0.1		2	7	15	
	d) all of the above			0.7		28	4	35	
	IB1b. Introduction of Species								
A (56)	If a giraffe was removed from its home in Africa and released into the state of Texas, the giraffe would be called a(n) ________________ species.								C
	a) exotic	.4639	.8773	0.7	0.538	41	10	54	
	b) endangered			-0.2		0	10	10	
	c) native			-0.4		0	16	21	
	d) threatened			-0.1		3	6	14	
B (58)	An exotic or introduced species is one that:								K
	a) has been removed from its original home and brought to a new area.	.4876	.8264	0.7	0.568	37	9	57	
	b) is brightly colored or very strange in its appearance.			-0.2		2	11	18	
	c) is from the tropics.			-0.1		2	7	14	
	d) once existed and has now gone extinct.			-0.1		0	6	6	

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
C (59)	When a new species is released into an area, it can threaten species already living there by:								K
	a) competing for food.	.5873	.8233	-0.1	0.387	2	4	15	
	b) competing for shelter.			-0.2		0	6	12	
	c) becoming food for other species.			-0.2		0	8	18	
	d) a and b			0.9		34	2	39	
	IB1c. Population Growth								
A (57)	As the number of humans on the planet increases, plant and animal species worldwide:								C
	a) are more seriously threatened.	.6485	.8739	0.7	0.769	44	15	77	
	b) increase.			-0.3		0	11	6	
	c) have a better chance of surviving, because there are more people to help save them.			-0.1		0	5	5	
	d) are more likely to reproduce.			-0.2		0	10	10	
C (61)	What is the most significant effect that an increasing world population has on the diversity of plants and animals?								E
	a) Biodiversity improves.	.3430	.8318	-0.0	0.324	8	9	27	
	b) The amount of available habitat for other species becomes less.			0.5		23	6	32	
	c) The amount of food available for people becomes less.			-0.0		4	5	17	
	d) The quality of life for humans goes down.			-0.0		1	2	9	

	IB1d. Pollution		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
A (58)	The effect that pollution has on biodiversity is:									K
	a)	not as much as other problems.	.4866	.8773	-0.2	0.798	1	8	8	
	b)	no effect.			-0.3		0	12	8	
	c)	**one of the most serious reasons for biodiversity loss.**			0.5		42	20	80	
	d)	not as much today as it had in the past.			-0.0		0	2	3	
B (59)	Pollution affects biodiversity most directly by:									C
	a)	helping plants and animals adapt to changing conditions.	.4289	.8284	-0.2	0.537	0	7	9	
	b)	spoiling the beauty of the natural world.			-0.2		1	10	23	
	c)	**decreasing the quality of habitat.**			0.7		40	10	54	
	d)	creating a need for hazardous waste dumps.			-0.1		0	6	9	
B (60)	A pollutant gets into an ecosystem and harms insects. How might this affect the ecosystem?									Ap
	a)	Plants are not harmed, so it doesn't affect the ecosystem.	.5244	.8253	-0.2	0.617	0	10	9	
	b)	**It harms part of the ecosystem, so it may affect other parts of the ecosystem.**			0.8		41	7	62	
	c)	It kills insects, so other animals in the ecosystem stay healthy.			-0.2		0	7	13	
	d)	Most animals eat plants so it doesn't affect the ecosystem much.			-0.2		0	7	8	

C (62)	If a stream becomes polluted with a pesticide, this can harm: a) tiny organisms that live in the stream. b) the fish that live in the stream. c) people that live several miles downstream. **d) all of the above.**	.6763	.8201	-0.2 -0.2 -0.2 0.9	0.430	0 0 0 36	7 3 7 2	13 16 12 43	Ap
	IB1e. Overconsumption	**Corr. Item Corr.**	**Alpha if Item Deleted**	**Disc. Index**	**Diff. Fact.**	**upp. quar. (N)**	**low. quar. (N)**	**To-tal %**	**BL**
A (59)	Some people like to have tropical birds as pets. The main reason this could cause a species to become endangered is that: a) the birds are often mistreated in people's homes. b) their natural predators are increasing and taking over the birds' habitat. c) they escape from people's homes, and can die in the unfamiliar habitat. **d) the demand for them could reduce wild populations.**	.3873	.8792	-0.2 -0.2 -0.1 0.6	0.538	0 2 5 37	9 12 10 11	16 12 16 54	K
A (60)	Some wild animals are used to make expensive items of clothing. This practice can threaten these species if: a) the species is overharvested to meet the demand for clothing. b) the clothing becomes part of a very popular social trend. c) the species sells for a lot of money. **d) all of the above**	.3152	.8807	-0.1 -0.2 -0.1 0.5	0.624	7 2 0 35	11 11 6 14	18 13 4 62	An

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
B (62)	Hunting and trapping are two human actions that can affect the population of a species. Probably the most important thing to consider before hunting or trapping is:								C
	a) whether or not it is socially acceptable to do so.	.4560	.8281	-0.1	0.642	1	4	6	
	b) whether or not the individual hunted is a trophy (in excellent condition).			-0.2		0	7	9	
	c) whether or not the population of the species is healthy enough to allow for the removal of individuals.			-0.1		1	16	73	
	d) whether or not the land where you hunt or trap is close to a city.			0.6		39	5	5	
C (48)	In countries where the economy is in trouble, biodiversity is most threatened by:								K
	a) the competition between plants and animals.	.2829	.8338	-0.2	0.408	0	6	12	
	b) people overusing the natural resources.			0.1		10	7	25	
	c) capturing and selling wild animals as pets.			-0.2		1	7	13	
	d) b and c.			0.6		25	4	41	
	IB2. The Value of Biodiversity to Humans **IB2a. Food/Water/Shelter/Oxygen**								
A (43)	Which of these foods originally came from wild plants? (a) lettuce (b) carrots (c) potatoes (d) grapes								K
	a) a and b only	.4829	.8769	-0.1	0.613	1	4	6	
	b) c only			-0.2		0	8	9	
	c) d only			-0.3		0	14	23	
	d) a, b, c, and d			0.6		42	17	61	

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
B (63) also goes under IA1a	Some scientists are concerned that some of our major food crops may be wiped out by an insect or a fungus. The best way to make sure that this does not happen is to increase ______________ among plants.								C
	a) interdependence	.2604	.8341	0.1	0.321	6	3	11	
	b) **genetic diversity**			0.4		22	5	32	
	c) ecosystem diversity			-0.2		6	14	27	
	d) interactions			-0.1		7	11	23	
B (64)	Thousands of plant species can be eaten by humans. Today our world is fed by about ___ species of plants.								K
	a) five (5)	.0618	.8427	-0.1	0.198	0	6	9	
	b) **a hundred (100)**			0.0		10	10	20	
	c) twenty-five thousand (25,000)			0.0		13	12	32	
	d) five hundred thousand (500,000)			0.3		18	5	33	
	IB2b. Medicine								
A (61)	All of the following statements are true except:								K
	a) Many of our medicines have come from wild plants and microorganisms.	.5290	.8766	-0.1	0.803	0	4	3	
	b) **Scientific laboratories are the only place left today to discover new medicines.**			0.6		44	17	80	
	c) Some plants contain cures for disease.			-0.3		0	11	8	
	d) Many plants used for medicine grow in the tropical regions of the world.			-0.2		0	10	7	

	IB2c. Aesthetics/Pleasure/Recreation	**Corr. Item Corr.**	**Alpha if Item Deleted**	**Disc. Index**	**Diff. Fact.**	**upp. quar. (N)**	**low. quar. (N)**	**Total %**	**BL**
B **(61)**	Biodiversity provides us with:								**C**
	a) food and medicine.	.4105	.8291	-0.1	0.642	1	6	11	
	b) disease resistance in agricultural crops.			-0.2		0	8	9	
	c) beauty and pleasure.			-0.1		1	5	8	
	d) **all of the above**			0.6		39	13	64	
	IB3. Science and Technology								
C **(66)**	Some insecticides that once worked to kill insects no longer work very well. This is because:								**Ap**
	a) new insect species develop every day.	.2576	.8347	0.0	0.331	5	5	21	
	b) the wrong kind of insecticides were used.			-0.1		5	9	21	
	c) **insects with natural resistance survived and multiplied.**			0.4		21	5	33	
	d) the insects produced many more offspring than the insecticide could kill.			0.1		5	3	11	
	IB3a. Ways it helps biodiversity								
A **(63)**	Wild plants are sometimes used to improve food crops. The science of discovering and using living organisms to improve human lives is called:								**K**
	a) **biotechnology.**	.3706	.8795	0.5	0.405	29	7	40	
	b) conservation biology.			-0.1		6	12	25	
	c) entomology.			-0.2		9	16	23	
	d) animal physiology.			-0.2		0	7	10	

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
B (68)	Biotechnology is the science of discovering and using living organisms to solve problems and improve human lives. A current example of this is:								C
	a) producing fuels from living organisms.	.3031	.8328	-0.0	0.457	3	5	12	
	b) using unleaded gas.			-0.1		0	6	10	
	c) increasing the growth of plant species.			-0.1		8	11	22	
	d) **a and c**			0.5		30	9	46	
B (65)	Which of the following can help protect species?								C
	a) supporting zoos that have breeding programs	.4900	.8263	-0.2	0.599	1	8	13	
	b) creating gene banks to store seeds and other plant parts			-0.2		0	7	9	
	c) researching to find out more about species			-0.1		1	7	11	
	d) **a, b and c**			0.7		39	10	60	
C (67)	A special collection of seeds and other plant parts that are stored for the future is called a seed bank. Seed banks are important because they:								C
	a) provide material that can be tested for improving crops.	.5202	.8257	0.0	0.373	0	0	8	
	b) allow us to preserve the genes of many plants.			-0.2		2	9	20	
	c) provide important information if a plant becomes extinct.			-0.2		2	8	19	
	d) **all of the above.**			0.8		32	5	37	

	IB3b. Ways it decreases biodiversity.								
A (64)	To grow a more successful food crop, farmers often apply pesticides to the crop. This practice can:								C
	a) kill insects other than the harmful ones.	.6064	.8743	-0.3	0.682	0	12	12	
	b) affect other organisms nearby.			-0.3		0	14	12	
	c) contaminate the groundwater.			-0.1		0	5	7	
	d) all of the above			0.8		44	11	68	
	IC. Knowledge of Biodiversity Issue Investigation and Action Strategies **IC1. Knowledge of strategies used to investigate environmental problems and issues**	**Corr. Item Corr.**	**Alpha if Item Deleted**	**Disc. Index**	**Diff. Fact.**	**upp. quar. (N)**	**low. quar. (N)**	**To-tal %**	**BL**
A (65)	Many people feel that by living in a sustainable way we can help slow the loss of biodiversity. This means that people should:								K
	a) never eat meat or use animal products.	.3883	.8790	-0.1	0.751	0	6	6	
	b) **use natural resources in ways that protect the resources for future generations.**			0.5		43	21	75	
	c) grow their own food.			-0.2		1	11	13	
	d) make cities larger so more people can live in them.			-0.1		0	4	4	
B (66)	To find out how many species exist in the world, more people will need to be trained to:								C
	a) manage diverse ecosystems.	.3746	.8303	-0.1	0.525	3	6	15	
	b) read through scientific accounts in many languages.			-0.2		0	9	14	
	c) **identify and classify both known and newly discovered species.**			0.6		37	11	52	
	d) live in remote areas of the world.			-0.1		1	6	11	

C (43)	Which group of people have information about the value of wild species for food and medicine?								K
	a) scientists	.3938	.8301	0.0	0.415	9	9	30	
	b) people who farm and grow their own food			-0.2		0	7	10	
	c) indigenous people (people who are originally from a given region)			-0.2		1	8	12	
	d) a, b, and c			0.6		26	3	42	
	IC2. Knowledge of appropriate action strategies for the prevention or resolution of environmental problems and issues.	**Corr. Item Corr.**	**Alpha if Item Deleted**	**Disc. Index**	**Diff. Fact.**	**upp. quar. (N)**	**low. quar. (N)**	**To-tal %**	**BL**
[illegible]	Which of the following actions does not help protect habitat?								An
	a) creating national parks.	.5500	.8753	-0.2	0.601	2	12	15	
	b) passing laws to limit the amount of forest that can be harvested.			-0.3		1	12	12	
	c) limiting recreational vehicle use in sensitive areas.			-0.3		0	11	12	
	d) allowing cattle to graze on public land.			0.8		41	7	60	
A (67)	If wild animal species need a place to live for the next 300 years it would be best to:								Ap
	a) put them in a zoo where they can be cared for and protected.	.3567	.8798	-0.1	0.590	1	7	8	
	b) put them in parks where they can be protected and still be free.			-0.0		4	6	17	
	c) let them live on land that people don't want to use.			-0.1		0	6	3	
	d) save large areas of the animals' natural habitat.			0.5		38	16	59	

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
A (68)	Which of the following is most likely to help protect endangered species?								E
	a) outlaw the sale of endangered species or products made from them (skins, furs, ivory, etc.).	.3169	.8807	-0.3	0.561	2	13	24	
	b) create zoos for key species.			-0.2		0	7	6	
	c) **protect the habitat where they live.**			0.6		41	14	56	
	d) use farming methods that do not damage habitat.			-0.0		0	1	1	
B (67)	The U.S. law that directly relates to protecting biodiversity is called:								K
	a) The Clean Water Act.	.1649	.8375	-0.1	0.377	0	5	7	
	b) **The Endangered Species Act.**			0.3		21	9	38	
	c) The Superfund Act.			-0.1		3	7	12	
	d) The Wildlife Forever Act.			0.1		17	11	35	
B (69)	Which of the following actions is least likely to help preserve biodiversity?								An
	a) **buying the lowest-priced fish and produce you can find**	.4781	.8266	0.8	0.500	38	5	50	
	b) becoming involved in political actions that work to prevent energy waste			-0.1		1	6	11	
	c) riding your bike or walking, instead of using a car for transportation			-0.3		2	13	17	
	d) recycling and reducing the amount of garbage you produce			-0.2		0	8	12	

		Corr. Item Corr.	Alpha if Item Deleted	Disc. Index	Diff. Fact.	upp. quar. (N)	low. quar. (N)	To-tal %	BL
C (63)	What is the **most helpful** way that your shopping habits can help preserve biodiversity?								An
	a) Only buy items that can be recycled.	.2611	.8466	0.3	0.120	17	6	33	
	b) Make sure that the products you buy did not involve animal testing.			0.1		14	9	30	
	c) Buy fewer things.			0.0		2	2	12	
	d) Avoid buying products with extra packaging.			-0.1		3	5	10	
C (68)	If you wanted to preserve the biodiversity of a particular region, what would be the **most effective** approach to protect the region **and** its inhabitants?								An
	a) protect the endangered species	.4392	.8285	0.1	0.338	12	10	28	
	b) protect the most abundant plants			-0.2		0	7	18	
	c) protect the ecosystem			0.6		24	4	34	
	d) protect the predators			-0.0		0	1	6	
C (69)	Which of the following would **not** help protect species?								An
	a) place a high dollar value on wild animals and plants	.3710	.8309	0.5	0.338	25	6	34	
	b) educate people about the importance of biodiversity			0.0		5	4	16	
	c) build better zoos			-0.1		3	6	21	
	d) purchase land for nature preserves			-0.1		3	6	13	

May 1995 Pilots A, B, and C: Affective Item Pool and Results of Item Analysis

Corr. Item Corr. = corrected item correlation; **Alpha if item del.** = subscale alpha if item was deleted; **Mean** = mean; **Std. Deviation** = standard deviation; **Str. Agree** = strongly agree; **Agree** = agree; **Disagree** = disagree; **Str. Dis.** = strongly disagree

***Number shown under response choices are actual numbers of responses.**

	The statistics below reflect analyses by subscale within each pilot.								
	II. AFFECTIVE OUTCOMES								
Item by Pilot	**Sensitivity Towards and Positive Values for the Prevention and Remediation of Biodiversity Problems and Issues Subscale** **Alpha for Pilot A = .7677** **Pilot B = .6241** **Pilot C = .8496**	**Corr. Item Corr.**	**Alpha if Item Deleted**	**Mean**	**Std. Dev.**	**Str. Agree (N)**	**Agree (N)**	**Dis-agree (N)**	**Str. Dis. (N)**
A (5)	I enjoy the sounds of birds and other animals when I'm outside.	.5383	.7859	2.267	.6912	65	93	9	6
B (5)	I don't enjoy listening to birds and other animals.	.4267	.5634	1.920	.9053	13	28	84	35
A (6)	There are many other things I would rather do than go outside to watch wildlife.	.5701	.7552	1.419	.9172	30	61	60	21
B (6)	I like to look for wild plants and animals when I am outside.	.2007	.6230	1.642	.9097	22	66	58	14
A (7)	I would like to know more about problems affecting biodiversity.	.5562	.7542	1.773	.7653	28	84	53	8
B (8)	I'm not interested in learning about problems affecting biodiversity.	.3237	.5915	1.975	.8485	11	24	87	39

		Corr. Item Corr.	Alpha if Item Deleted	Mean	Std. Dev.	Str. Agree (N)	Agree (N)	Dis-agree (N)	Str. Dis. (N)
C (5)	I like to learn about plants and animals that I hadn't known about before.	.6255	.8296	1.939	.8046	32	79	23	8
C (6)	I enjoy watching wildlife.	.5821	.8326	2.062	.9380	53	55	23	11
A (13)	I think the loss of habitat around the world is a very serious issue.	.5349	.7610	2.494	.6352	96	67	7	3
A (15)	I will always want to see real wildlife, even though I can see TV programs about them.	.5735	.7502	2.395	.7300	90	63	16	4
B (17)	I think it's better to see real plants and animals in the wild than in movies or on TV.	.2685	.6047	2.105	.8084	54	79	21	8
B (7)	I feel sad hearing that a species has become extinct, even if I hadn't heard of it before.	.3336	.5894	2.086	.8220	53	79	21	9
B (15)	Most plants and animals aren't useful to people so it doesn't matter if they become extinct.	.3230	.5914	2.451	.8989	10	9	45	96
B (10)	I think it is important to protect the diversity of plants.	.3748	.5822	2.117	.7341	48	91	17	6
C (11)	I do not think we need to protect all plants.	.5332	.8370	2.385	.8838	7	12	43	78
B (12)	I am more concerned about the effects of human actions (such as building roads and houses) on biodiversity than the effects of natural disasters (such as floods or volcanoes) on biodiversity.	.1573	.6378	1.722	.9859	31	66	44	19
B (13)	I think it is a good idea to set land aside to protect plants and animals.	.3889	.5761	2.321	.8164	79	65	9	9
C (13)	I am concerned about how much people are changing the habitats of plants and animals.	.6947	.8228	2.000	.8536	38	71	22	10

C (7)	**The diversity of species is important in my own life.**	**.5552**	**.8351**	**1.839**	**.8609**	**32**	**66**	**32**	**11**
C (9)	**A species can have value just because it is interesting to watch.**	**.4287**	**.8466**	**1.685**	**.9153**	**25**	**56**	**40**	**19**
C (14)	**It's OK for our school to make the playground larger even if it means harming some endangered plants.**	**.5491**	**.8356**	**2.208**	**.8689**	**8**	**12**	**64**	**57**
C (16)	**Plants and animals exist so they can be used by humans.**	**.3942**	**.8528**	**1.939**	**1.055**	**15**	**34**	**39**	**52**
C (17)	**Because we get so many medicines from plants and animals, it's important to protect all species.**	**.5806**	**.8335**	**2.362**	**.7875**	**70**	**55**	**11**	**5**
C (32)	**I believe it is important to support laws that help protect biodiversity.**	**.6213**	**.8292**	**2.039**	**.8663**	**43**	**68**	**16**	**10**
	III. BELIEFS ABOUT PERSONAL and SOCIETAL EFFICACY RELATING TO BIODIVERSITY (Predictors of Behavior)	**Corr. Item Corr.**	**Alpha if Item Deleted**	**Mean**	**Std. Dev.**	**Str. Agree (N)**	**Agree (N)**	**Dis-agree (N)**	**Str. Dis. (N)**
	A. Locus of Control **Subscale Alpha Pilot A = .7857** **Pilot B = .5055** **Pilot C = .6835**								
A (17)	**I don't think I could do anything to help pass a law to protect biodiversity, because people like me can't make a difference. (Political Action)**	**.5342**	**.7558**	**2.139**	**.9336**	**14**	**17**	**72**	**69**

		Corr. Item Corr.	Alpha if Item Deleted	Mean	Std. Dev.	Str. Agree (N)	Agree (N)	Dis-agree (N)	Str. Dis. (N)
B (20)	I don't think I could help get a law passed to protect biodiversity. But I think other people could help. **(Political Action)**	.1213	.5201	1.519	.8867	12	77	52	19
A (18)	If I write a letter to a politician to support a law protecting plants and animals, my letter might help get the law passed. **(Political Action)**	.4539	.7676	1.819	.7651	25	108	26	14
A (30)	If I found out that my state was trying to pass a law to protect biodiversity, I would write a letter to my state representative supporting it. **(Political Action)**	.3916	.7775	1.813	.8917	44	67	49	12
C (22)	If I wrote a letter to a politician asking for help in protecting biodiversity, it wouldn't matter. Politicians don't listen to people my age. **(Political Action)**	.4022	.6474	1.493	1.013	27	41	52	20
A (19)	I could convince my classmates to protect biodiversity. **(Persuasion)**	4613	.7666	1.608	.7767	18	81	60	13
C (23)	I don't think I could convince my classmates to help protect biodiversity. **(Persuasion)**	.3644	.6585	1.464	.9449	24	48	53	15
B (22)	It wouldn't help for me to talk about the importance of biodiversity with my family. They only listen to what other people have to say. **(Persuasion)**	.3055	.4402	1.924	.8487	8	34	85	33
B (23)	I believe that endangered species are doomed, even if I try to convince everyone I know to protect them. **(Persuasion)**	.3704	.4022	1.753	.9884	17	48	61	34
A (20)	There is nothing I can do to help endangered species. Luck will decide if a species survives or not. **(Ecomanagement)**	.5426	.7557	2.368	.7730	4	15	67	83
A (24)	Even if I do things like recycle and use less water, it won't help protect biodiversity. **(Ecomanagement)**	.5231	.7577	2.235	.8306	8	18	70	76

		Corr. Item Corr.	Alpha if Item Deleted	Mean	Std. Dev.	Str. Agree (N)	Agree (N)	Dis-agree (N)	Str. Dis. (N)
B (26)	By recycling, using less water, and doing other things to help the environment, I can help protect biodiversity. (Ecomanagement)	.0891	.5280	2.152	.8153	51	87	12	10
C (27)	It's worth my time to do things like recycle and save water even if other people don't. (Ecomanagement)	.5006	.6153	2.196	.8949	55	63	11	10
A (21)	I could help protect biodiversity by refusing to buy things that harm plants and animals. (Consumerism)	.4433	.7694	2.259	.6869	64	88	15	5
B (24)	Even if I changed my shopping habits and became more aware of how they affect biodiversity, I don't think I could help protect plants and animals. (Consumerism)	.3150	.4388	1.715	.7908	11	45	82	24
C (24)	Even if I refuse to buy things that are harmful to wildlife, my actions wouldn't matter because so many others still buy harmful things. (Consumerism)	.4232	.6397	1.674	1.048				
A (22)	Even if I gave only a small amount of money to a group that protects biodiversity, my money can help make a difference. (Consumerism)	.5813	.7529	2.223	.6909	61	95	13	4
C (25)	Whatever happens to a species is going to happen, even if I spend a lot of my own money trying to protect it. (Consumerism)	.4715	.6238	1.623	.9218	15	46	57	21
A (23)	If I saw a person break the law and harm wildlife, it wouldn't do any good to report the person because adults don't listen to someone my age. (Legal Action)	.3702	.7826	2.012	.9534	17	25	69	62
B (25)	I could help protect biodiversity by reporting that a person illegally harmed wildlife. (Legal Action)	.1793	.4927	1.918	.7978	33	91	26	12
B (35)	If I saw people illegally killing wildlife, I don't think I would report them. (Legal Action)	.3410	.4227	2.196	.8776	7	24	60	66
C (26)	If I saw someone illegally harm wildlife, I would report that person. (Legal Action)	.3295	.6693	1.986	.9358	48	51	28	11

	B. Assumptions of Personal Responsibility **Subscale Alpha Pilot A = .8173** **Pilot B = .7800** **Pilot C = .7113**	Corr. Item Corr.	Alpha if Item Deleted	Mean	Std. Dev.	Str. Agree (N)	Agree (N)	Dis-agree (N)	Str. Dis. (N)
A (10)	I am not interested in joining a group that is working to protect biodiversity.	.5238	.7990	1.834	.8775	12	44	81	35
A (32)	I want to become involved in an organization that works to protect plants and animals.	.5960	.7874	1.527	.8097	21	63	73	14
B (9)	I am not interested in joining a group that protects biodiversity.	.4598	.7627	1.500	.8908	21	61	55	23
A (25)	Kids my age don't need to know about biodiversity.	.5759	.7936	2.521	.6276	2	6	65	100
B (27)	Kids my age don't need to help protect biodiversity, but adults should.	.3203	.7880	2.199	.8682	9	17	69	63
A (26)	The way I live shows that I want to protect the diversity of life.	.3925	.8145	1.604	.6920	12	90	61	9
B (28)	I would like to make sure that the way I live doesn't harm biodiversity.	.4918	.7574	2.000	.5792	23	116	17	4
A (27)	It is not my responsibility to try to get my school to do things like recycle and use less paper to help protect habitat.	.5706	.7913	2.018	.8485	10	35	73	55
A (31)	I'd like to help figure out ways our school could do things to protect biodiversity.	.6315	.7823	1.834	.7919	31	94	37	11
B (33)	It is my responsibility to try to get my school to do things like recycle and use less paper to help protect biodiversity.	.4729	.7579	1.827	.7801	30	75	48	7

		Corr. Item Corr.	Alpha if Item Deleted	Mean	Std. Dev.	Str. Agree (N)	Agree (N)	Dis-agree (N)	Str. Dis. (N)
B (34)	I should encourage my school to buy products that are not harmful to wildlife.	.5867	.7382	1.942	.7555	34	85	32	7
A (29)	I should tell others about things they can do to protect biodiversity, such as shopping wisely and reducing what they use.	.5463	.7951	1.888	.7354	31	100	33	8
B (31)	I would like to let people know how their shopping choices can affect wild species.	.6187	.7338	1.808	.7195	22	93	38	7
C (10)	I feel like I need to tell people about the importance of biodiversity.	.4527	.6695	1.284	.8637	11	46	57	27
C (30)	I should tell my friends and family about the importance of biodiversity.	.5605	.6300	1.881	.8045	27	75	27	9
A (33)	It is not my responsibility to change the way I live in order to help protect biodiversity.	.4688	.8064	2.124	.8252	9	22	80	61
C (29)	I am willing to make changes in the things I do every day that will help protect biodiversity.	.5354	.6367	1.769	.8576	20	72	33	11
B (30)	My friends and I need to be concerned about biodiversity even if we aren't doing anything to harm it.	.4949	.7548	2.109	.6679	37	101	19	2
C (28)	I don't need to be concerned about endangered species because I'm not doing anything to harm them.	.3574	.7179	2.142	1.027	12	18	54	52
B (32)	I should ask adults to support laws that protect biodiversity.	.4996	.7546	2.000	.6426	29	103	24	4
C (33)	If I knew that a species was in danger of becoming extinct near my home, I would do something to protect it.	.4711	.6622	2.000	.8757	43	59	24	11

	C. Societal Responsibility **Subscale Alpha Pilot A = .8213** **Pilot B = .7146** **Pilot C = .7580**	**Corr. Item Corr.**	**Alpha if Item Deleted**	**Mean**	**Std. Dev.**	**Str. Agree**	**Agree**	**Dis-agree**	**Str. Dis-agree**
A (9)	**If every person did their part, we could prevent species from going extinct.**	**.3643**	**.8007**	**2.435**	**.7837**	**103**	**47**	**19**	**4**
A (11)	**It's OK to pass laws limiting hiking, biking, and other human activities to protect an ecosystem.**	**.2323**	**.8180**	**1.735**	**.9137**	**33**	**80**	**36**	**22**
A (16)	**People should be able to use bicycles and cars wherever they want, even if it harms an ecosystem.**	**.5152**	**.7854**	**2.177**	**.8094**	**7**	**19**	**84**	**62**
B (11)	**It is important that we protect plant and animal habitats, even if human activities such as hiking and biking are limited.**	**.3473**	**.6967**	**2.013**	**.7980**	**43**	**82**	**28**	**9**
C (12)	**We should limit the use of bicycles, boats, and other vehicles if they destroy habitat and endanger species.**	**.4553**	**.7350**	**1.528**	**.9745**	**28**	**44**	**46**	**24**
A (12)	**I think people should make changes in their lives that will help slow the extinction of species.**	**.6137**	**.7756**	**2.241**	**.7658**	**70**	**81**	**16**	**6**
A (28)	**I believe that my friends need to make changes in their lives to protect biodiversity.**	**.4531**	**.7919**	**1.735**	**.7657**	**26**	**84**	**54**	**8**
A (14)	**People should be more concerned about using too many of the Earth's natural resources.**	**.6053**	**.7789**	**2.406**	**.6661**	**85**	**77**	**8**	**3**
A (34)	**People of all ages should be learning about the importance of biodiversity.**	**.5103**	**.7866**	**2.294**	**.7187**	**74**	**81**	**14**	**4**
C (8)	**People of all ages should be learning about the need for biodiversity.**	**.5461**	**.7258**	**1.984**	**.9342**	**11**	**24**	**87**	**39**
A (35)	**People around the world are not responsible for protecting endangered species.**	**.4497**	**.7927**	**2.412**	**.8606**	**10**	**12**	**47**	**104**
B (36)	**Biodiversity loss is only a problem in other countries. People in the U.S. don't need to take responsibility for it.**	**.4431**	**.6810**	**2.373**	**.8177**	**5**	**16**	**55**	**82**

		Corr. Item Corr.	Alpha if Item Deleted	Mean	Std. Dev.	Str. Agree (N)	Agree (N)	Dis-agree (N)	Str. Dis. (N)
A (36)	**We have enough laws to protect the world's plants and animals. We do not need more laws.**	.5658	.7797	2.182	.8404	9	21	72	71
B (19)	**We should pass laws to control the things people do that harm species.**	.4364	.6823	2.234	.8074	63	75	17	6
A (37)	**The government should do more to stop people from polluting and destroying wildlife habitat**	.4402	.7932	2.394	.6906	84	77	8	4
B (37)	**The government needs to pass more laws to protect plants, animals, and their habitats.**	.4148	.6856	2.139	.8253	54	77	20	7
C (20)	**I think our government should support laws (such as the Endangered Species Act) that protect biodiversity.**	.4761	.7340	2.244	.8703	65	57	9	10
C (39)	**Our government is leaving too much land for wildlife. People should be able to build houses, roads, or shops wherever they want.**	.3759	.7436	2.181	.9954	11	14	53	56
A (38)	**I believe we can do a lot to help protect plants and animals around the world.**	.4656	.7908	2.294	.7104	71	87	10	5
C (21)	**Anyone can help prevent species from becoming endangered.**	.4476	.7365	2.181	.8946	59	56	17	10
B (14)	**Human population growth should not be slowed to protect biodiversity.**	.3864	.6903	1.854	.8433	10	40	73	39
C (15)	**I think that we should limit the number of people living on the planet in order to protect biodiversity.**	.1378	.7678	1.008	.9718	14	23	52	50 - /3
B (16)	**I think Americans are making and using too many things that end up harming habitats in our own country and around the world.**	.3867	.6909	2.234	.7501	61	72	25	2
B (29)	**I think Americans should be able to buy as many products as they want, even if it hurts the environment.**	.5165	.6662	2.247	.9007	8	19	61	70

		Corr. Item Corr.	Alpha if Item Deleted	Mean	Std. Dev.	Str. Agree (N)	Agree (N)	Dis-agree (N)	Str. Dis. (N)
C (18)	It's OK for people in the U.S. to use more resources than people in other countries, because we have a higher standard of living.	.3788	.7432	2.032	.9507	10	28	54	49
C (34)	People in the United States should protect endangered species.	.5860	.7237	2.284	.8535	64	52	13	8
B (18)	We can't rely on science and technology to protect the world's biodiversity.	.1367	.7340	1.658	.9153	25	72	45	18
C (19)	Technology is improving so rapidly that we no longer need to rely on new plants and animals for food and medicine.	.1415	.7666	2.079	.9395	11	22	55	54
B (21)	I think it's important for people to learn how to resolve conflicts if we want to protect biodiversity.	.3868	.6909	2.000	.7487	37	94	24	7
B (38)	I think it's impossible to protect biodiversity and still protect people's jobs.	.3191	.7025	1.690	.9093	15	47	74	21
C (36)	I think it's impossible to protect biodiversity and still protect people's jobs. I think jobs are more important.	.2736	.7544	1.646	.9882	20	33	55	28
C (31)	Information about biodiversity should be taught in all schools.	.6266	.7180	2.079	.9051	48	61	20	10
C (35)	Every person in the United States should know how important biodiversity is.	.5710	.7263	2.079	.8127	43	65	23	6
A (8)	No matter where they live, people should know about the importance of biodiversity.	.4994	.7677	2.372	.6675	81	75	15	2
C (37)	Most people in society are willing to help solve environmental problems.	.1450	.7655	1.386	.9089	12	46	57	20
C (38)	I don't think most Americans are willing to change their lifestyle in order to protect endangered plants and animals.	.1188	.7667	1.110	.8566	33	65	28	9

Relationship of Items to the *Windows on the Wild* Biodiversity Education Framework

A = May 1995 - Pilot A **B = May 1995 - Pilot B** **C = May 1995 - Pilot C**
D = December Pilot **F = Final Instrument**

EVALUATION OUTLINE	A	B	C	D	F
I. COGNITIVE OUTCOMES					
A. Knowledge Of Ecological Principles And Processes Related To Biodiversity					
1. Three Levels of Biodiversity	1	1		1	1
a. Genetic Diversity	2	1	2	3	2
b. Species Diversity	2	2	1	2	2
c. Ecosystem Diversity	1	1	2	2	2
2. Ecological Factors Affecting Biodiversity					
a. Ecosystem change	1	1	1	2	1
b. Evolution and extinction	3	1	3	2	1
3. The Ecological Value of Biodiversity					
a. Ecosystem, structure, function, and interdependence	3	6	5	6	4
b. Adaptation and resilience	2	2	3	2	1
B. Knowledge of Problems and Issues Related to Biodiversity					
1. Political, Economic, and Social Issues Affecting Biodiversity	2	1	1	2	2
a. Habitat Destruction	1	1	2	2	2
b. Introduction of Species	1	1	1	1	1
c. Population Growth	1		1	3	2
d. Pollution	1	2	1	2	2
e. Overconsumption	2	1	1	3	3
2. The Value of Biodiversity to Humans					*
a. Food/Water/Shelter/Oxygen	1	2			
b. Medicine	1				
c. Aesthetics/Pleasure/Recreation		1		1	
3. Science and Technology			1	2	
a. Ways it helps biodiversity	1	2	1		
b. Ways it decreases biodiversity	1				
C. Knowledge of Biodiversity Issue Investigation and Action Strategies					
1. Knowledge of strategies used to investigate biodiversity problems and issues.	1	1	1	1	1
2. Knowledge of appropriate action strategies for the prevention or resolution of environmental problems and issues.	3	2	3	5	5

II. AFFECTIVE OUTCOMES					
A. Sensitivity Towards and Positive Values for the Prevention and Remediation of Biodiversity Problems and Issues					
1. Sensitivity	3	3	2		1
2. Values	2	6	8	**50	**18
B. Beliefs about Personal and Societal Efficacy Relating to Biodiversity (Predictors of Behavior)					
1. Locus of Control a. Political Action	3	1	1	2	1
b. Persuasion	1	1	2	2	1
c. Ecomanagement	2	1	1	2	1
d. Consumerism	2	1	2	2	1
e. Legal Action	1	2	1	2	1
2. Hopefulness/Hopelessness				4	3
3. Assumptions of Personal Responsibility	8	8	5	8	4
4. Societal Responsibility	12	11	13	13	8

*This part of the framework was represented by several of the Likert items in the final instrument.

**In the December 1995 pilot and the final instrument, most of the "values" items were item sets or "clusters."

Appendix F

Populations Used in Piloting

May 1995 Piloting Teachers

Washington D.C.:
Dan Bogan
Sidwell Friends School
Washington, D.C.

David Wood
Sidwell Friends School
Washington, D.C.

Sam Scudder
Hart Jr. High School
Washington, D.C.

Terese C. Johnston
George Washington
Middle School
Alexandria, VA

Rochester, New York
Bonnie Bush
Charlotte Middle School
Rochester, NY

Seattle, Washington
Julie West
North Tapps School
Sumner, WA

Lynn Bleaker
Albert Einstein Middle
School
Seattle, WA

Chicago, Illinois
Beth Locallo
Chicago, IL

Kathryn Peecher
Revere School
Chicago, IL

Katherine Sahlas
Irving School
Berwyn, IL

Atlanta, Georgia
Jenny Poole
Lanier Middle School
Buford, GA

Terry Greene
Lanier Middle School
Buford, GA

Sallie Kirby
Pickneyville Middle
School
Norcross, GA

December 1995 Piloting Teachers:

Julie West (two classes)
North Tapps Middle School
Sumner, WA

Beth Locallo (two classes)
Chicago, IL

Dan Bogan/David Wood
Sidwell Friends School
Washington, DC

Jenny Poole
Lanier Middle School
Buford, GA

Terry Greene
Lanier Middle School
Buford, GA

Bonnie Bush
Charlotte Middle School
Rochester, NY

Appendix G

December 1995 Pilot Results

December 1995 Pilot item pool and results

Corr. Item Corr. = corrected item correlation; **Alpha if item del.** = subscale alpha if item was deleted; **Mean** = mean; **Std. Dev.** = standard deviation; **Str. Agree** = strongly agree; **Agree** = agree; **Dis.** = disagree; **Str. Dis.** = strongly disagree; **dbl. id**. **top half %** = percentage of students who were self identified and teacher identified as environmentally literate who chose the first two environmentally-preferred responses; **Sid. %** = percentage responses of an exceptional environmental science class; **Self id** = students who identified themselves as environmentally literate; **Dbl id.** = students who were identified by themselves and by their teachers as environmentally literate._***Number shown under response choices are percentages of responses. *Items whose number is underlined were included on the final instrument.**

NOTE: percentages do not add to 100 because "other" responses were not included.	Corr. Item Corr.	Alpha if item deleted	Mean	Std. Dev.	%	%	%
1. What is your gender? a) female b) male					48 fe-male	48 male	
2. Compared to other subjects you study, how do you feel about studying environmental topics? a) less interested b) about the same c) more interested					less 14	same 51	more 31
3. Compared with other students your age, how well do you understand problems related to the environment? a) above average b) average c) below average					abov e ave. 20	ave. 69	below ave. 7

To what degree have each of the following contributed to your understanding of the environment and environmental problems?					great deal	some	hard-ly any	none		
					%	%	%	%		
4. school					39	49	6	2		
5. books, newspapers, or magazines I have read on my own					27	40	20	9		
6. special programs or activities such as clubs, scouting, or 4H					21	22	18	35		
7. television programs					30	35	20	11		
8. family and family activities					20	31	24	20		
9. friends					16	20	26	32		
	Corr. Item Corr.	Alpha if item deleted	Mean	Std. Dev.	know a lot	know a little %	heard of it %	never heard of it%	top half %	dbl. id top half %
Please mark the letter of the phrase that best describes what you know about each of the following topics: SCALE ALPHA: .7033-.0050=.6983										
10. species	.4386	.6734	2.283	.6299	36	53	6	1	89	100
11. habitat	.3389	.6869	2.459	.6259	50	40	5	0	90	100
12. extinction	.3223	.6878	2.489	.7853	60	26	6	4	86	95
13. indigenous cultures	.3240	.6918	950	1.065	8	18	26	42	26	42
14. ecosystems	.4654	.6590	1.530	1.001	18	32	28	18	40	63
15. cultural diversity	.3989	.6758	1.101	1.122	12	18	27	37	30	53
16. ecology	.3750	.6783	1.556	.9037	13	36	35	11	49	64
17. genetics	.4296	.6673	1.601	1.056	21	31	31	18	52	68
18. endangered species	.3797	.6800	2.626	.6847	67	22	5	1	89	95

II. AFFECTIVE OUTCOMES Sensitivity Towards and Positive Values for the Prevention and Remediation of Biodiversity Problems and Issues	Corr. Item Corr.	Alpha if item deleted	Mean	Std. Dev.	str. agree %	agree %	dis. %	str. dis. %	top half %	double id top half %
A. Values (Items 85-94 fit here as well) (four items weren't enough to run these as a subscale for reliability)										
19. Some plants and animals aren't useful to people so it doesn't matter if they become extinct.			2.359	.8654	6	6	31	53	84	84
20. I think it's more important to protect animals than it is to protect plants or fungi.			1.677	.9325	11	25	41	17	58	53
26. A plant or animal can be important just because it is interesting to watch.			1.546	1.010	14	38	25	18	52	58
44. Plants and animals mainly exist so they can be used by humans.			2.288	.9140	7	10	28	50	78	89
I think learning about the diversity of plants, animals, and ecosystems is important because: SCALE ALPHA: .7210 - .0050 = .7160										
58. it's nice to know about the outdoors and things that live there.	.4840	.6772	2.231	.7829	38	46	6	5	84	95
59. I want to know what I can do to help protect them.	.5478	.6613	2.055	.8053	29	49	12	5	78	84
60. there are many interesting jobs relating to these things.	.5295	.6648	1.945	.8300	23	50	16	7	73	84
61. it is more fun to study them than many other things in school.	.3472	.7175	1.860	1.036	32	29	23	11	61	79
62. some of the species may be gone by the time I am an adult.	.4470	.6853	2.080	.8063	31	47	13	5	78	100
63. we use many species for food and medicine.	.2310	.7317	2.050	.7638	24	54	14	3	78	79

64. my future, as well as future generations, depend on healthy ecosystems.	.4747	.6779	2.251	.8688	42	39	8	6	81	100
Imagine that the government wanted to protect a species from becoming extinct. How much do you agree or disagree with each of the following reasons for doing so? (reliability analysis not run for this set because environmentally-preferred choice was not clear on every item.)					str. agree %	agree %	dis. %	str. dis. %	top half %	dbl. id top half %
65. so future generations can enjoy them					36	43	10	6	79	95
66. because they are important members of the natural (ecological) community					31	43	14	8	74	95
67. because they may attract tourists					12	28	36	18	40	47
68. because of their value to science and research					21	39	24	11	60	68
69. because they have the right to exist					53	26	7	9	79	95
70. so that we can use them as a source of food					9	25	32	30	34	58
71. because I would like having more species around					33	43	14	6	76	74
Consider the following people. How important do you think the protection of biodiversity is for each group? SCALE ALPHA: .7617-.0050=.7117	Corr. Item Corr.	Alpha if Item deleted	Mean	Std. Dev.	very impt. %	impt. %	little impt. %	not impt. %	top half %	dbl. id. top half %
85. scientists who work for drug companies	.2393	.7178	1.749	1.037	27	32	22	15	59	58
86. people who live in the city	.3904	.6928	1.615	.8798	14	38	34	9	52	42
87. kids my age	.4231	.6868	1.795	.9680	25	31	30	9	56	58
88. politicians	.4214	.6866	1.656	1.065	19	30	29	15	49	47
89. people who live in Africa	.2372	.7175	1.795	1.010	28	29	26	12	57	58
90. loggers	.3561	.6985	1.426	1.079	18	24	30	23	42	31
91. poor people	.3223	.7033	1.569	.9839	19	28	33	15	47	53
92. older people (such as grandparents)	.4328	.6861	1.903	.9057	27	38	21	8	65	84

93. people who live in the country	.4751	.6807	1.970	.8610	28	38	23	5	66	79
94. businessmen	.4958	.6739	1.462	1.006	16	28	34	18	44	32
How important do you think it is to protect the following? **SCALE ALPHA: .7361 - .0050 = .7311**	Corr. Item Corr.	Alpha if Item deleted	Mean	Std. Dev.	very impt. %	impt. %	little impt. %	not impt. %	top half %	dbl. idtop half %
95. plants that produce food for people (such as corn)	.2750	.7329	2.242	.8019	55	27	9	3	82	90
96. plants that have beautiful flowers (like roses)	.3928	.7158	1.731	.9496	24	31	31	9	55	69
97. animals that are in many food webs (such as mice)	.3450	.7259	1.797	1.046	31	29	22	14	60	84
98. rain forest plants	.4122	.7135	2.442	.7843	57	24	11	2	81	95
99. birds that sing pretty songs (like robins)	.4466	.7062	1.761	.9943	25	32	27	11	57	68
100. birds that eat dead animals (such as vultures)	.5703	.6819	1.858	1.025	32	28	23	12	60	84
101. plants that are worth a lot of money (such as trees)	.2630	.7344	2.294	.7919	45	36	11	3	81	95
102. animals that live in the city (such as pigeons)	.5305	.6910	1.751	.9605	23	37	23	12	60	74
103. desert ecosystems (such as the Sahara Desert)	.4588	.7039	2.010	.9897	39	29	19	9	68	90
How important do you think it is to protect each of the following kinds of plants and animals? **SCALE ALPHA: .9071 - .0050 = .9021**										
104. hummingbirds	.6157	.9004	1.984	.9571	33	35	18	9	68	84
105. frogs	.7115	.8968	1.990	.9095	32	34	23	7	66	95
106. whales	.4885	.9053	2.516	.7724	62	24	6	4	86	100
107. snakes	.6551	.8989	1.953	.9339	33	30	26	6	63	90
108. worms	.7054	.8963	1.755	1.077	29	27	22	17	56	58
109. vultures	.6228	.9001	1.896	1.033	35	27	22	12	62	74
110. butterflies	.7009	.8967	1.776	1.027	29	25	29	12	54	53
111. fungi	.6141	.9005	1.620	1.062	25	23	30	17	48	63

112. mosquitoes	.5668	.9029	1.240	1.104	18	19	26	33	37	42
113. trees	.3527	.9101	2.568	.8656	72	12	6	6	84	100
114. spiders	.7497	.8944	1.734	1.032	28	26	28	13	54	79
115. bats	.7535	.8941	1.672	1.079	27	26	26	17	53	84
116. cockroaches	.5514	.9038	1.021	1.144	15	17	18	46	32	37
III. BELIEFS about PERSONAL and SOCIETAL EFFICACY RELATING to BIODIVERSITY (Predictors of Behavior)	Corr. Item Corr.	Alpha it Item deleted	Mean	Std. Dev.	str. agree %	agree %	dis. %	str. dis. %	top half %	dbl. id top half %
A. Locus of Control **SCALE ALPHA: .7377-.0050=.7327**										
24. If I wanted to, I could help get a law passed to protect plants and animals. **(Political Action)**	.4822	.7077	1.497	.9968	15	34	30	17	49	69
30 I write a letter to a politician to support a law protecting plants and animals, my letter might help get the law passed. **(Political Action)**	.5110	.7056	1.723	.9335	18	40	27	10	58	79
21. I could convince my classmates to protect plants and animals. **(Persuasion)**	.3678	.7214	1.580	.8720	14	39	32	11	53	58
43. It probably won't help for me to talk about the importance of plants and animals with my family. They usually only listen to what adults have to say. **(Persuasion)**	.2752	.7309	1.944	.9535	9	18	37	31	68	84
29. It's worth my time to do things like recycle and save water to protect the environment, even if other people don't.**(Ecomanagement)**	.5382	.7049	2.303	.8469	47	35	8	6	82	95
37. If I do things like planting trees and putting up nesting boxes, this can help animals that are in danger of becoming threatened or extinct. **(Ecomanagement)**	.5441	.7018	1.959	.9407	29	43	13	10	72	90

25. By refusing to buy certain products I can help protect plants and animals. **(Consumerism)**	.4058	.7181	2.139	.8350	35	45	10	6	80	95
31. Even if I refuse to buy things that use a lot of resources, my actions won't matter because so many others are still buying too much. **(Consumerism)**	.2478	.7342	1.323	.9965	22	36	23	14	37	32
32. If I saw a person break the law and harm wildlife, it wouldn't do much good to report the person because adults usually don't listen to people my age. **(Legal Action)**	.1324	.7501	1.708	1.127	21	18	27	30	57	58
39. If I found out that a pet store was selling illegal parrots, snakes, or other pets, I would find out how to stop them. **(Legal Action)**	.4594	.7105	1.913	.9884	30	37	16	12	67	95
23. No matter what we do, I think the rain forests of the world will disappear. **(Hopeless/Helpless)**	.2774	.7310	1.939	.9981	12	14	40	29	69	90
28. Even though there are less than 6,000 tigers left in the wild, I am sure there will still be some left in the wild when I'm an adult. **(Hopeful/Helpful)**	.0471	.7560	1.636	1.013	17	39	24	15	56	42
36. Twenty years from now, I think my community will be a better place to live. **(Hopeful/Helpful)**	.3025	.7287	1.354	1.062	13	26	32	23	39	58
45. I believe that endangered species are doomed no matter what we do. **(Hopeful/Helpful)**	.4292	.7142	1.954	.9648	9	18	36	32	68	79

B. Personal Responsibility and Interest **SCALE ALPHA: ..8285-.0050=.8235**	Corr. Item Corr.	Alpha if Item deleted	Mean	Std. Dev.	str. agree %	agree %	dis-agree %	str. dis. %	top half %	dbl. id top half %
22. I think it is my responsibility to tell my friends, family, and other people about the importance of preserving plants and animals.	.6616	.7927	1.739	.9940	24	35	24	13	59	79
27. I think it is my responsibility to let people know how the things they buy can affect the environment.	.6088	.8008	1.723	.9390	21	37	26	11	58	74
33. I am **not** interested in joining a group or club that protects plants and animals.	.5484	.8093	1.990	.9685	9	18	34	35	69	79
34. I am willing to make changes in the way I live to help protect plants and animals.	.6253	.7995	1.908	.8685	24	46	18	8	70	100
40. Kids my age don't need to help protect the environment, but adults should.	.4633	.8211	2.190	.9685	9	12	27	47	74	89
41. The things I do every day show how I protect the environment.	.4134	.8253	1.523	.8143	10	36	40	9	46	68
42. It is my responsibility to try to get my school to do things like recycle and use less paper.	.5283	.8045	1.528	.9377	14	36	30	16	50	84
52. I think that it's my responsibility to help protect species.	.5173	.8132	1.672	.8822	18	35	33	8	53	84

D. Societal (Others) Interest and Responsibility **SCALE ALPHA: .7223-.0050=.7123**	Corr. Item Corr.	Alpha if Item deleted	Mean	Std. Dev.	str. agree %	agree %	dis-agree %	str. dis. %	top half %	dbl. id top half %
35. I think laws that help protect plants and animals are important.	.4427	.6962	2.440	.7782	54	32	5	4	86	100
38. When someone owns land, they should be able to build on it or do whatever they want with it.	.4944	.6849	1.236	1.027	28	31	22	13	35	58

46. People should be able to buy whatever they want.	.4493	.6910	1.565	1.073	19	27	26	23	49	74
47. We should limit the use of bicycles, boats, and other vehicles if they harm the environment.	.4569	.6909	1.639	.9735	19	36	26	14	55	74
48. I believe that my friends need to make changes in their lives to protect the environment.	.3938	.7000	1.618	.8859	15	39	30	11	54	90
49. People of all ages should learn about the importance of the variety of species on earth.	.5165	.6873	2.246	.8125	41	40	11	4	81	100
50. People in other countries should worry about the loss of plants and animals more than people in the United States.	.2064	.7233	1.869	.9726	11	16	39	27	66	79
51. People in the city have more important things to worry about than the loss of plants, animals, and ecosystems.	.4337	.6945	2.026	.9372	7	20	33	35	68	90
53. I think we should limit the number of people living on the planet to protect the environment.	-.0284	.7533	1.057	1.017	7	20	33	34	27	47
54. Because we have a higher standard of living, it's OK for people in the U.S. to use more resources (such as oil and coal) than people in other countries.	.4748	.6896	2.157	.9156	6	13	37	39	76	84
55. I think that people like scientists and engineers can solve most of the world's environmental problems.	.0493	.7393	1.607	.8931	9	35	37	14	51	53
56. I think it's impossible to protect the environment and still protect people's jobs.	.4190	.6963	1.754	.9443	9	27	39	19	58	68
57. Most people I know are willing to change how they live to help solve environmental problems.	.2633	.7156	1.367	.9187	9	30	40	15	39	47

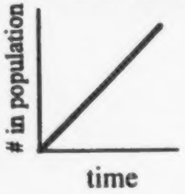
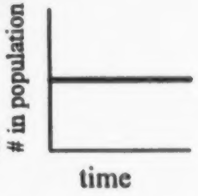
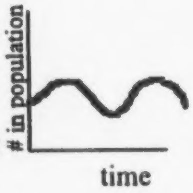
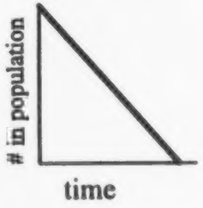
Corr. Item Corr. = corrected item correlation; **Alpha if item deleted** = subscale alpha if item was deleted; **upp. quar. (N)** = number in upper quartile of respondents; **low. quart.** = number in lower quartile of respondents; **Disc. Index** = discrimination index; **Difficulty Fact.** = difficulty factor; **Total %** = percent of students who chose each response; **Sid. %** = percentage of students from Sidwell Friends School who chose each response; **Self id.** = students who identified themselves as environmentally literate; **Dbl id.** = students who were identified by themselves and by their teachers as environmentally literate; **BL** = Bloom's Taxonomy of Cognitive Objectives (K = Knowledge; C = Comprehension; An = Analysis; Ap = Application; S = Synthesis; E = Evaluation.) *(NOTE: Percentages do not add up to 100 % because missing responses are not included.)*

I. Cognitive Outcomes **IA. Knowledge of Ecological Principles and Processes Related to Biodiversity** **1A1. Three Levels of Biodiversity** **SCALE ALPHA: .7772-.0050=.7722**	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low. quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
117. Biodiversity is the diversity of life on earth. To learn more about biodiversity, scientists study these three levels of diversity:											Know.
a) species, habitats, ecosystems	.0626	.7787	24	12	.2	.152	31	51	34.9	36.8	
b) ecosystems, genetics, endangered species			2	6	-.1		9	8	16.3		
c) ecosystems, genetics, species			7	3	.1		15	13	9.3	21.1	
d) species, ecosystems, wildlife			10	6	.1		16	6	9.3	21.1	
e) don't know			10	18	-.2		25	19	27.9	21.1	
IA1a. Genetic Diversity											
118. Grevy's zebra is an endangered species in Africa. The stripes on one Grevy's zebra can look very different from the stripes of another Grevy's zebra. This is **most likely** a result of:											Comp.
a) ecosystem diversity.	.2392	.7733	1	4	-.1	.365	4	2	9.3	5.3	
b) genetic diversity.			33	8	.5		36	62	34.9	63.2	
c) species diversity.			7	6	0		17	17	14.0	10.5	
d) a and c			9	9	0		22	15	25.6	5.3	
e) don't know			3	15	-.2		15	0	11.6	15.8	

	Corr. Item Corr.	Alpha if Item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
125. People rely on a diversity of wild corn species to create new corn varieties that will resist pests and diseases. This is an example of the importance of:											Comp.
a) genetic diversity.	.2042	.7744	16	4	.2	.161	16	68	16.3	31.6	
b) ecosystem diversity.			4	8	-.1		14	8	20.9	10.5	
c) insect pests.			4	7	-.1		15	6	11.6	5.3	
d) all of the above			15	6	.2		22	4	23.3	26.3	
e) don't know			14	18	-.1		29	11	25.6	26.3	
149. Some scientists are concerned that some of our major food crops may be wiped out by an insect or a fungus. The best way to make sure that this does not happen is to increase ______________ among plants.											Comp.
a) interdependence.	.0409	.7804	5	5	0	.218	11	19	9.3	10.5	
b) genetic diversity.			11	3	.2		22	43	27.9	36.8	
c) ecosystem diversity.			11	10	0		19	15	14.0	21.1	
d) interactions.			4	4	0		12	9	11.6	15.8	
e) don't know			22	20	0		30	8	32.6	15.8	
IA1b. Species Diversity											
120. Among the following, which group of living things has the largest number of identified species?	.1960	.7750									Know.
a) mammals			14	10	.1	.318	27	15	18.6	36.8	
b) plants			9	6	.1		18	21	14.0	15.8	
c) insects			27	9	.3		32	45	41.9	42.1	
d) birds			0	7	-.1		7	4	7.0	5.3	
e) don't know			3	11	-.2		12	13	16.3		

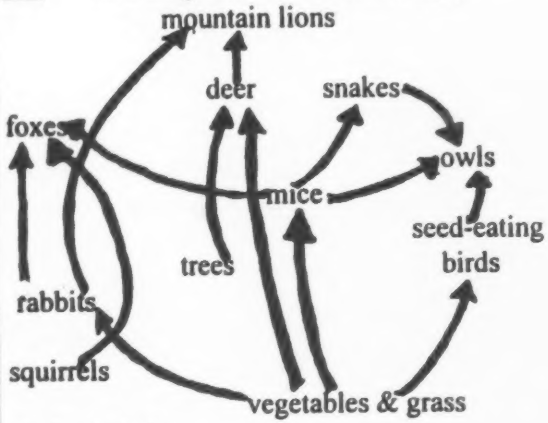
121. Scientists have identified approximately 1.5 million species living on Earth. Most scientists feel that this number is probably:											Know.
a) a little more than the total number of species that exist.	.3136	.7704	6	8	-.0	.246	18	9	16.3	26.3	
b) much too high, and many species have been incorrectly identified.			1	6	-.1		10	2	11.6	5.3	
c) about half the number of living species.			9	3	.1		18	13	16.3	21.1	
d) only a portion of the total that exist.			28	1	.5		25	64	23.3	26.3	
e) don't know			9	24	-.3		24	9	27.9	21.1	
1A1c. Ecosystem Diversity	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
122. An interacting community of living things and their environment is called a(n):											Know.
a) ecosystem.	.3256	.7698	30	4	.5	.303	30	66	32.6	52.6	
b) food chain.			3	4	-.0		12	11	14.0	10.5	
c) population.			4	6	-.0		11	9	16.3		
d) habitat.			15	18	-.1		33	4	25.6	31.6	
e) don't know			1	11	-.2		9	6	9.3	5.3	
157. If you wanted to preserve the biodiversity of a particular region, what would be the **most effective** approach to protect the region **and** its inhabitants? (Also fits in under IC2)											Eval.
a) protect the endangered species	.1564	.7766	16	8	.2	.327	23	11	20.9	36.8	
b) protect the most abundant plants			4	8	-.1		15	13	14.0	21.1	
c) protect the ecosystem			26	9	.3		33	57	25.6	36.8	
d) protect the predators			2	0	.0		4	2	7.0		
e) don't know			4	16	-.2		18	9	27.9		

IA2. Ecological Factors Affecting Biodiversity **IA2a. Ecosystem change**	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
130. Natural disasters (such as volcanoes, floods, and fires) will often disturb healthy ecosystems. Which will **not** help a disturbed ecosystem recover from these kinds of disasters?											Anal.
a) the diversity of native plants and animals in the ecosystem	.4448	.7657	2	6	-.1	.232	11	9	4.7	10.5	
b) the size of the species populations in the system			5	7	-.0		11	6	25.6	5.3	
c) the overall size of the system			4	4	.0		14	8	11.6	5.3	
d) the number of roads which help people get into the ecosystem			25	1	.5		23	58	18.6	57.9	
e) don't know			17	24	-.1		36	17	34.9	21.1	

131. Which of the following graphs represents the typical trend of most populations over time? increases stays the same a)  b)  goes up and down decreases c)  d)  e) don't know	.0098	.7816	33 0 14 3 3	12 7 6 4 13	.4 -.1 .2 -.0 -.2	.261	38 6 26 10 14	36 4 42 6 11	27.9 7.0 27.9 16.3 16.3	57.9 26.3 15.8	K n o w .

IA2b. Evolution and Extinction	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	Total %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
132. Which of the following is **true** about extinction? a) It's not a natural process because the last big species to become extinct were the dinosaurs.	.1453	.7772	0	3	-.1	.412	6	8	4.7	5.3	Comp.
b) It's a natural process, but the rate of extinction is increasing because of people's actions.			30	14	.3		41	75	41.9	36.8	
c) It's not a natural process because people are the only species that can cause other species to become extinct.			11	8	.1		19	2	14.0	31.6	
d) It's a natural process, but the rate of extinction is decreasing because people are protecting endangered species.			5	2	.1		9	4	9.3	10.5	
e) don't know			7	14	-.1		19	6	25.6	15.8	
150. When a species is extinct it: **a) no longer exists.**	.3127	.7703	49	20	.5	.630	63	74	62.8	78.9	Know.
b) is seriously threatened.			2	8	-.1		9	9	11.6		
c) is found only in certain habitats.			0	3	-.1		9	2	11.6	5.3	
d) is rare.			1	4	-.1		5	6	2.3	5.3	
e) don't know			1	6	-.1		6	2	7.0	10.5	

IA3. The Ecological Value of Biodiversity **IA3a. Ecosystem structure, function, and interdependence**	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
123. In a sealed, healthy aquarium, the oxygen is produced by:											App.
a) fish.	.1703	.7762	1	5	-.1	.455	9	11	9.3	10.5	
b) water plants.			33	13	.4		45	66	48.8	47.4	
c) snails.			0	4	-.1		6	4	7.0		
d) water.			13	10	.1		22	11	18.6	31.6	
e) don't know			6	11	-.1		12	6	14.0	10.5	
124. If all bacteria were suddenly removed from the Earth:											App.
a) animals would have no difficulty in digesting food.	.3391	.7692	2	4	-.0	.327	9	6	9.3		
b) we would soon be knee deep in garbage and dead organic matter.			30	8	.4		33	72	32.6	63.2	
c) human diseases would disappear.			13	9	.1		26	9	32.6	26.3	
d) ecosystems would still work normally.			1	2	-.0		6	0	7.0	5.3	
e) don't know			7	20	-.2		22	11	16.3	5.3	

	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact .	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	B L
128. This diagram best describes a(n):  mountain lions deer snakes foxes owls mice seed-eating birds trees rabbits squirrels vegetables & grass a) food chain. b) ecosystem. **c) food web.** d) species webscape. e) don't know	.1193	.7777	28 2 20 2 1	24 4 6 4 4	.1 -.0 .3 -.0 -.1	.256	44 9 26 9 6	8 4 83 2 2	39.5 9.3 30.2 9.3 7.0	52.6 10.5 31.6 5.3	Know.
129. The first link in a food chain is often a(n): a) animal. b) person. c) bacteria. **d) plant.** e) don't know	.3471	.7687	3 4 6 38 2	12 4 10 8 8	-.2 .0 -.1 .6 -.1	.445	19 11 12 45 7	6 4 11 75 2	14.0 16.3 11.6 48.8 4.7	5.3 10.5 5.3 68.4 5.3	Know.

	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
136. In parts of Asia, large nectar-drinking bats help pollinate plants in the rain forest. They also help spread seeds and maintain the health of the ecosystem. In this example, the bat is considered a(n):											Know.
a) keystone species.	.2186	.7739	18	6	.2	.194	19	62	20.9	36.8	
b) producer.			19	10	.2		34	8	32.6	42.1	
c) introduced species.			3	3	.0		11	6	7.0		
d) critical predator.			4	5	-.0		10	8	11.6	5.3	
e) don't know			9	18	-.2		20	11	23.3	15.8	
138. Scientists are concerned that the world's frog populations are decreasing. Which of the following is not a reason for their concern?											App.
a) The decrease may mean that the habitat of other species is in danger.	.1683	.7757	3	6	-.1	.223	14	13	11.6	5.3	
b) Since frogs are part of many food webs, the decrease may harm other species.			11	5	.1		16	9	16.3	15.8	
c) The decrease may mean that air or water sources are polluted.			8	8	.0		23	15	25.6	31.6	
d) The decrease may mean that oxygen supplies on Earth are decreasing.			22	8	.3		22	49	18.6	26.3	
e) don't know			9	14	-.1		19	8	20.9	21.1	

IA3b. Adaptation and resilience	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
134. Which of the following is **not** an example of a physical adaptation?	.2301	.7736									Comp.
a) a plant with waxy leaves			11	7	.1	.308	16	15	14.0	15.8	
b) a fox that lost its tail in a fight			26	4	.4		31	66	32.6	36.8	
c) a weasel changing color from season to season			3	7	-.1		13	8	11.6	10.5	
d) a hawk with a curved beak			5	4	.0		10	0	16.3	15.8	
e) don't know			8	20	-.2		24	6	20.9	21.1	
137. Which of the following is true?											Comp.
a) All animals can adapt to changing conditions faster than plants.	.5015	.7626	4	6	-.0	.303	10	6	14.0	5.3	
b) Adaptations usually only occur as a result of hurricanes, floods, and other disasters.			4	8	-.1		18	8	20.9	10.5	
c) Smaller organisms take longer to adapt than larger organisms.			3	7	-.1		16	6	2.3	15.8	
d) Species either adapt over time or go extinct as a result of change.			38	2	.7		30	58	39.5	52.6	
e) don't know			4	19	-.3		21	17	18.6	15.8	

IB. Knowledge of Problems and Issues Related to Biodiversity

IB1. Political, Economic, and Social Issues Affecting Biodiversity

In your mind, how much do each of the following contribute to the loss of biodiversity today?	a great deal	some	hard-ly	none
72. evolution **(FITS IN UNDER IA2b above)**	26	42	15	11
73. U.S. human population size	39	31	14	12
74. China's population size	27	28	23	15
75. rubber tappers in the rain forest	21	33	20	20
76. what Americans buy	30	41	15	10
77. water pollution	45	29	9	12
78. TV commercials and magazine ads	18	30	25	22

	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	B L
135. There are five major reasons for biodiversity loss. Which list below best describes these?											Know.
a) habitat loss, introduced species, pollution, overpopulation, overconsumption	.2077	.7743	20	3	.3	.213	21	34	23.3	42.1	
b) introduced species, pollution, overpopulation, predators, hunting			6	6	.0		16	11	14.0	21.1	
c) overfishing, pollution, overpopulation, infectious diseases, habitat loss			13	7	.1		19	30	14.0	21.1	
d) predators, introduced species, overconsumption, infectious diseases, hunting			6	3	.1		10	8	11.6		
e) don't know			7	23	-.3		27	11	32.6	15.8	

	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	B L
146. All of the following trends (I-IV) affect biodiversity. Which combination of two affect biodiversity the most? I. Increasing number of people living in urban areas. II. Increasing rate of consumption. III. Increasing human population. IV. Increasing number of toxic waste dumps being cleaned up.											Know.
a) I and III	.2546	.7726	13	4	.2	.280	16	19	18.6	26.3	
b) I and IV			5	11	-.1		15	19	11.6	15.8	
c) II and III			19	9	.2		27	38	25.6	26.3	
d) I and II			5	4	.0		10	2	9.3	10.5	
e) don't know			11	14	-.1		27	15	30.2	21.1	
IB1a. Habitat Destruction											
140. Scientists think that more species are becoming extinct today than in the past because:											Know.
a) species are not as strong as they used to be.	.1914	.7752	0	9	-.2	.336	8	4	2.3	5.3	
b) there are too many species in the world.			2	4	-.0		11	11	16.3	10.5	
c) habitat changes are happening too fast for species to adapt.			31	8	.4		34	53	41.9	52.6	
d) all of the above			20	9	.2		34	21	25.6	31.6	
e) don't know			0	13	-.2		8	6	9.3		

	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	B L
141. If a shopping mall is built in a wetland area, the **most immediate** threat to the plants and animals that live there is:											App.
a) an increase in the number of roadkills (animals killed by cars).	.3437	.7688	2	14	-.2	.483	21	15	23.3	15.8	
b) the loss of habitat.			44	9	.7		48	62	55.8	68.4	
c) air pollution from the increased traffic.			4	4	.0		10	8	9.3	10.5	
d) an increase in the number of people in the area.			2	4	-.0		7	6	7.0		
e) don't know			1	11	-.2		9	4	4.7	5.3	
IB1b. Introduction of Species											
142. If giraffes were released into the wild in the state of Texas, they would be called a(n):											Comp.
a) native species.	.4248	.7653	3	4	-.0	.436	10	4	11.6	5.3	
b) introduced species.			44	6	.7		44	72	44.2	89.5	
c) endangered species.			0	9	-.2		12	9	9.3		
d) threatened species.			5	6	-.0		12	2	9.3	5.3	
e) don't know			1	17	-.3		17	8	20.9		

IB1c. Population Growth	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
143. As the number of humans on the planet increases, plant and animal species worldwide will probably:											App.
a) be more likely to reproduce.	.4780	.7629	1	4	-.1	.464	8	11	4.7	5.3	
b) increase in diversity.			2	6	-.1		12	11	7.0	10.5	
c) have a better chance of surviving, because there are more people to help save them.			1	10	-.2		15	8	11.6	78.9	
d) be more seriously threatened.			47	7	.8		46	58	58.1	5.3	
e) don't know			2	15	-.2		13	6	9.3		
144. Which of the following is **not** true about the human population?											Know.
a) It is expected to double within your lifetime.	.2635	.7723	2	6	-.1	.251	13	11	16.3	15.8	
b) It is declining in the United States and Canada.			28	4	.5		25	55	23.3	31.6	
c) Its increase has led to the loss of habitat around the world.			11	8	.1		20	17	14.0	42.1	
d) The greatest rate of population growth is occurring in some developing areas of South America and Africa.			6	5	.0		13	6	11.6	5.3	
e) don't know			6	18	-.2		23	6	30.2	5.3	
145. The current human population of the Earth is between:											Know.
a) 5-10 billion.	.1365	.7767	13	5	.2	.185	18	40	14.0	42.1	
b) 1-2 billion.			1	6	-.1		13	13	20.9	5.3	
c) 70-100 million.			7	9	-.0		20	15	14.0	15.8	
d) 15-20 billion.			27	10	.3		28	23	30.2	26.3	
e) don't know			5	11	-.1		14	4	14.0	10.5	

IB1d. Pollution	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
126. When a farmer uses a strong pesticide to kill insects destroying his/her crop, which of the following is true?											Comp.
a) This has no short term effect, but has a significant long term effect.	.3708	.7679	2	10	-.2	.299	11	15	14.0	15.8	
b) This has immediate effects, but no long term effects.			9	6	.1		18	6	16.3	21.1	
c) This has neither short term nor long term effects.			1	5	-.1		10	6	16.3		
d) This has both short term and long term effects.			32	2	.6		30	60	30.2	47.4	
e) don't know			9	19	-.2		25	9	18.6	15.8	
133. An aquatic ecosystem is contaminated by a chemical which tends to remain stored in body fat. The highest concentration of this chemical would probably be found in which group of organisms in the ecosystem?											App.
a) plant life	.2903	.7719	8	7	.0	.147	24	8	30.2	21.1	
b) minnows			2	4	-.0		6	9	7.0	5.3	
c) fish that eat insects and plants			9	4	.1		18	8	14.0	15.8	
d) birds that eat fish			17	6	.2		15	53	11.6	26.3	
e) don't know			17	21	-.1		31	19	32.6	31.6	

IB1e. Overconsumption	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
139. What will probably happen if it becomes fashionable to wear necklaces made with owl feathers for good luck?											App.
a) The number of wild owls will increase and the price of wild owl feathers will stay about the same.	.3739	.7675	1	4	-.1	.517	6	9	4.7		
b) The number of wild owls will decrease and the price of wild owl feathers will stay about the same.			3	12	-.2		20	9	14.0	26.3	
c) The number of wild owls and the price of wild owl feathers will stay about the same.			1	5	-.1		9	0	11.6	5.3	
d) The number of wild owls will decrease and the price of wild owl feathers will increase.			47	11	.7		52	75	51.2	68.7	
e) don't know			1	9	-.2		7	0	11.6		
147. Which of the following is true?											Know.
a) People in India and China use more resources per person than people in most other countries.	.2043	.7746	4	7	-.1	.280	13	6	11.6	15.8	
b) As a country's population increases, people always use less resources because they learn to use them wisely.			3	10	-.1		18	4	23.3	10.5	
c) North Americans use more resources per person than people in most other countries.			29	5	.5		28	58	25.6	52.6	
d) People in Europe and Japan use about the same amount of resources per person as Americans do.			5	3	.0		9	13	14.0		
e) don't know			12	17	-.1		27	13	20.9	21.1	

148. Some people like to have tropical birds as pets. The **main** reason this could cause a species to become endangered is that:											Eval.
a) the birds are often mistreated in people's homes.	.2452	.7731	13	14	-.0	.199	25	11	25.6	31.6	
b) their natural predators are increasing and taking over the birds' habitat.			7	6	.0		16	13	16.3	5.3	
c) they escape from people's homes, and can die in the unfamiliar habitat.			13	9	.1		21	13	16.3	10.5	
d) the demand for them could reduce wild populations.			19	1	.3		20	55	27.9	36.8	
e) don't know			1	11	-.2		12	2	9.3	15.8	
IB2. The Value of Biodiversity to Humans **IB2a. Food/Water/Shelter/Oxygen** **IB2b. Medicine** **IB2c. Aesthetics/Pleasure/Recreation**	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
IB3. Science and Technology											
119. The science of discovering and using living organisms to improve human lives is called:											Know.
a) conservation biology.	.0960	.7783	4	8	-.1	.209	14	13	7.0	21.1	
b) biotechnology.			15	4	.2		21	49	32.6	36.8	
c) entomology.			2	3	-.0		9	8	9.3	5.3	
d) animal physiology.			6	4	.0		10	6	14.0	15.8	
e) don't know			25	24	.0		40	19	34.9	21.1	

	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
127. An example of a "fossil fuel" is:											Know.
a) natural gas.	.2488	.7729	39	13	.5	.498	50	72	58.1	57.9	
b) uranium.			5	4	.0		14	11	9.3	15.8	
c) biomass.			4	8	-.1		12	4	9.3	5.3	
d) electricity.			1	3	-.0		4	8	2.3		
e) don't know			4	14	-.2		15	4	16.3	21.1	
151. Which of the following is **not** an example of biotechnology?											Comp.
a) producing organisms that can consume oil	.0796	.7787	2	5	-.1	.218	10	9	14.0	15.8	
b) producing fuels from living organisms			3	6	-.1		12	9	9.3	5.3	
c) using unleaded gas in cars and trucks			19	5	.3		22	60	16.3	36.8	
d) selectively breeding cows to increase their growth			7	4	.1		11	4	18.6	5.3	
e) don't know			22	22	.0		39	9	37.2	36.8	

IC. Knowledge of Biodiversity Issue Investigation and Action Strategies

IC1. Knowledge of strategies used to investigate biodiversity problems and issues.

Imagine you are reading an article about reintroducing wolves into Yellowstone National Park. How important would each of the following be in helping you detect if the article is biased? (When an article is biased, it is slanted toward a certain viewpoint and tends to present a one-sided view of the issue.)	very impt %	impt %	little impt %	not impt %
79. the source of information in the article	31	44	14	5
80. who was interviewed in the article	22	33	28	11
81. the length of the article	14	25	25	32
82. whether the article has a summary	13	323	34	25
83. the type of magazine the article is published in	16	24	24	30
84. the author	16	20	34	25

153. When working to help resolve an issue in your community, you would first:											Eval.
a) learn more about the issue.	.3331	.7693	40	11	.5	.469	47	72	51.2	57.9	
b) interview city/town council about their views.			2	8	-.1		14	9	7.0	15.8	
c) write letters to people about how you felt on the issue.			3	5	-.0		11	6	11.6	5.3	
d) survey citizens about their ideas.			4	6	-.0		10	4	9.3	5.3	
e) don't know			3	10	-.1		9	4	16.3	10.5	
IC2. Knowledge of appropriate action strategies for the prevention or resolution of environmental problems and issues.	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	Total %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
152. Many people feel that by living in a sustainable way, we can help slow the loss of biodiversity. This means people should:											Know.
a) never use animal products.	.3256	.7697	8	5	.1	.360	17	23	16.3	5.3	
b) use natural resources in ways that protect them for the future.			31	6	.5		36	55	39.5	47.4	
c) use technology to create more jobs.			3	15	-.2		18	2	11.6	15.8	
d) make cities smaller so more people will live in the country.			4	3	.0		7	8	16.3	10.5	
e) don't know			7	13	-.1		17	8	11.6	21.1	

	Corr. Item Corr.	Alpha if item deleted	upp. quar. (N)	low quar. (N)	Disc Ind.	Diff. Fact.	To-tal %	Sid. %	Self id. N=43	Dbl. id. N=19	BL
154. Which of the following is **most** likely to help protect endangered species?											Eval.
a) outlaw the sale of endangered species or products made from them (skins, furs, ivory, etc.).	.1643	.7764	20	10	.2	.355	30	11	27.9	47.4	
b) create zoos for key species.			0	10	-.2		10	8	16.3		
c) protect the habitat where they live.			29	11	.3		36	70	39.5	36.8	
d) use farming methods that do not damage habitat			1	4	-.1		10	4	7.0	10.5	
e) don't know			1	6	-.1		6	2	4.7	5.3	
155. The U.S. law that directly relates to protecting biodiversity is called:											Know.
a) The Migratory Waterfowl Act.	.3311	.7699	2	7	-.1	.213	9	8	7.0	15.8	
b) The Endangered Species Act.			22	2	.4		21	36	30.2	31.6	
c) The Superfund Act.			0	5	-.1		11	8	11.6	5.3	
d) The Wildlife Forever Act.			11	10	.0		19	21	14.0	15.8	
e) don't know			17	17	.0		32	23	32.6	26.3	
156. What is the **most helpful** way that your shopping habits can help preserve biodiversity?											Eval.
a) Only buy items that can be recycled.	.0395	.7785	16	10	.1	.071	25	32	27.9	31.6	
b) Make sure that the products you buy did not involve animal testing.			19	11	.2		30	26	32.6	21.1	
c) Avoid buying products with extra packaging.			5	5	.0		13	13	11.6	21.1	
d) Buy fewer things.			6	2	.1		7	19	4.7	10.5	
e) don't know			6	13	-.1		18	4	18.6	10.5	

157. Also belongs here - See IA1c. Ecosystem Diversity											
158. Which of the following is the best example of sustainable use of natural resources?											Eval.
a) using paper bags instead of plastic bags	.1539	.7764	10	6	.1	.237	19	8	23.3	15.8	
b) using natural gas instead of oil to heat your home			6	5	.0		12	28	9.3	5.3	
c) using products that don't involve animal testing			8	9	-.0		18	13	16.3	15.8	
d) riding your bike instead of driving			19	8	.2		24	40	18.6	52.6	
e) don't know			6	13	-.1		18	4	23.3	5.3	

Appendix E

Subscale Analysis Relative to Discrimination Between Environmentally Aware Students and the General Population

May 1995 Pilot A: Comparisons of Means between "environmentally literate" (EL) groups and the rest of piloting population (RP) (shaded numbers are significant using p ≤ .05 as level of significance). **(Total N = 173)**

Pilot A: Self-identified environmentally literate students

SUB-SCALE	Sensitivity/ Values (scale 0-3)	Locus of Control (scale 0-3)	Personal Responsibility (scale 0-3)	Societal Responsibility (scale 0-3)	Cognitive Questions (scale 0-4)
0 (RP) N=125	2.01	2.02	1.85	2.18	2.34
1(EL) N=48	2.18	2.12	2.07	2.34	3.06
level of significance	.054	.237	.014	.022	.000

Pilot A: Teacher identified environmentally literate students

SUB-SCALE	Sensitivity/ Values (scale 0-3)	Locus of Control (scale 0-3)	Personal Responsibility (scale 0-3)	Societal Responsibility (scale 0-3)	Cognitive Questions (scale 0-4)
0 (RP) N=137	2.03	2.04	1.89	2.19	2.44
1 (EL) N=36	2.17	2.07	2.00	2.33	2.93
level of significance	.196	.755	.236	.104	.001

Pilot A: Double identified environmentally literate students

SUB-SCALE	Sensitivity/ Values (scale 0-3)	Locus of Control (scale 0-3)	Personal Responsibility (scale 0-3)	Societal Responsibility (scale 0-3)	Cognitive Questions (scale 0-4)
0 (no) N=159	2.02	2.03	1.87	2.19	2.49
1 (EL) N=14	2.49	2.21	2.34	2.63	3.19
level of significance	.001	.039	.000	.000	.001

May 1995 Pilot B: Comparisons of Means between "environmentally literate" (EL) groups and the rest of piloting population (RP) (shaded numbers are significant using p ≤ .05 as level of significance). **(Total N = 162)**

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Pilot B: Self-identified environmentally literate students

SCALE	Sensitivity/ Values (scale 0-3)	Locus of Control (scale 0-3)	Personal Responsibility (scale 0-3)	Societal Responsibility (scale 0-3)	Cognitive Questions (scale 0-4)
0 (RP) N=116	1.98	1.82	1.82	2.01	2.12
1 (EL) N=46	2.17	1.99	2.04	2.08	2.59
level of significance	.011	.027	.015	.365	.000

Pilot B: Teacher identified environmentally literate students

SCALE	Sensitivity/ Values (scale 0-3)	Locus of Control (scale 0-3)	Personal Responsibility (scale 0-3)	Societal Responsibility (scale 0-3)	Cognitive Questions (scale 0-4)
0 (RP) N=38	2.02	1.85	1.89	2.02	2.15
1 (EL) N=124	2.08	1.94	1.88	2.05	2.58
level of significance	.438	.209	.956	.709	.002

Pilot B: Double identified environmentally literate students

SCALE	Sensitivity/ Values (scale 0-3)	Locus of Control (scale 0-3)	Personal Responsibility (scale 0-3)	Societal Responsibility (scale 0-3)	Cognitive Questions (scale 0-4)
0 (RP) N=143	2.02	1.86	1.88	2.03	2.26
1 (EL) N=19	2.13	1.98	1.97	2.05	2.80
level of significance	.260	.192	.503	.860	.011

May 1995 Pilot C: Comparisons of Means between "environmentally literate" (EL) groups and the rest of piloting population (RP) (shaded numbers are significant using $p \leq .05$ as level of significance). **(Total N = 142)**

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Pilot C: Self-identified environmentally literate students

SCALE	Sensitivity/ Values (scale 0-3)	Locus of Control (scale 0-3)	Personal Responsibility (scale 0-3)	Societal Responsibility (scale 0-3)	Cognitive Questions (scale 0-4)
0 (RP) N=109	1.98	1.70	1.72	1.78	1.56
1 (EL) N=33	2.17	1.80	1.90	1.86	1.86
level of significance	.114	.430	.171	.461	.088

Pilot C: Teacher identified environmentally literate students

SCALE	Sensitivity/ Values (scale 0-3)	Locus of Control (scale 0-3)	Personal Responsibility (scale 0-3)	Societal Responsibility (scale 0-3)	Cognitive Questions (scale 0-4)
0 (RP) N=123	2.03	1.72	1.75	1.79	1.56
1 (EL) N=19	2.01	1.76	1.84	1.86	2.01
level of significance	.887	.766	.603	.564	.068

Pilot C: Double identified environmentally literate students

SCALE	Sensitivity/ Values (scale 0-3)	Locus of Control (scale 0-3)	Personal Responsibility (scale 0-3)	Societal Responsibility (scale 0-3)	Cognitive Questions (scale 0-4)
0 (RP) N=137	2.02	1.70	1.75	1.80	1.61
1 (EL) N=5	1.98	2.27	1.92	1.79	2.13
level of significance	.865	.040	.664	.932	.329

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December 1995 Pilot: Comparisons of Means between "environmentally literate" (EL) groups and rest of piloting population (RP) (shaded numbers are significant using $p \leq .05$ as level of significance). **(Total N = 211)**

December Pilot: Self-identified environmentally literate students

SCALE	Attitudes/ Values (scale 0-3)	Locus of control (scale 0-3)	Personal Responsibility (scale 0-3)	Societal Responsibility (scale 0-3)	Cognitive Items (scale 0-1)
0 (RP) N=168	1.85	1.73	1.69	1.74	.302
1 (EL) N-43	2.06	1.93	1.89	1.99	.374
level of significance	.004	.005	.040	.002	.013

December Pilot: Teacher identified environmentally literate students

SCALE	Attitudes/ Values (scale 0-3)	Locus of control (scale 0-3)	Personal Responsibility (scale 0-3)	Societal Responsibility (scale 0-3)	Cognitive Items (scale 0-1)
0 (RP) N=147	1.89	1.73	1.68	1.75	.298
1 (EL) N=64	1.90	1.86	1.83	1.89	.360
level of significance	.820	.064	.064	.049	.007

December Pilot: Double identified environmentally literate students

SCALE	Attitudes/ Values (scale 0-3)	Locus of control (scale 0-3)	Personal Responsibility (scale 0-3)	Societal Responsibility (scale 0-3)	Cognitive Items (scale 0-1)
0 (RP) N=192	1.87	1.75	1.69	1.76	.304
1 (EL) N=19	2.10	2.01	2.10	2.13	.453
level of significance	.007	.016	.001	.000	.000

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Appendix I

Formative Evaluation Instrument
Used in Evaluating
Windows on the Wild Activities

To:

From: Judy Braus
Director of Environmental Education
World Wildlife Fund

Date: March, 1996

World Wildlife Fund (WWF) is currently developing a new environmental education program called "Windows on the Wild". The overall goal for "Windows" is to increase environmental literacy using biodiversity as the organizing theme. Initially, the program is focused on middle school students and educators. As part of the program, WWF is producing a series of curriculum modules on various biodiversity issues.

For the past year, WWF has also been developing a student survey to find out what middle school students know and think about environmental issues related to biodiversity. The survey will help determine whether or not the "Windows" curriculum helps improve students' knowledge of and attitudes towards biodiversity.

By the third week of April, we will be ready to pilot five introductory biodiversity activities using the survey as a pre-test and post-test. (See the description on the next page.) **In order to run the pilot, we are looking for 7th or 8th grade science or social studies teachers who are willing to commit seven classroom periods to conduct the pre- and post-tests and the five activities.** The first period would be spent conducting the pre-test. You would then have two weeks to conduct the five activities in a way that works best for you (every other day; all in one week, etc). The last period would be spent conducting the post-test.

You only need to conduct the survey and activities with one class, but you are welcome to do so with as many classes as you'd like. You can choose the time period that is best for you between the third week of April and the end of your school year.

If you participate, it is important that the pilot happens **within a span of 12 classroom days and that no more than one period is spent on each activity.** It is also necessary that your classes be "average" - not advanced or special groups. Copies of the activities will be sent to you by mid-April so that you can prepare your curriculum accordingly. We will then send you all of the supplies that you will need for conducting the pre- and post-tests.

We realize the constant demands placed on teachers and that this is a big commitment, especially this late in the school year. However, we also feel that you and your students will enjoy using the materials. The results of the survey will also help provide important information that can help guide future education programs. In return for your help, WWF will provide a full set of "Windows" materials. (This includes a classroom set of biodiversity magazines with an educator's guide and curriculum modules when they are produced next year.) We will also provide you with a $100 honorarium to be used for classroom supplies.

If you or any other teachers in your school are interested in participating in the "Windows on the Wild" curriculum pilot, please contact AnneMarie Fleming as soon as possible at: Wisconsin Center for Environmental Education, 403 LRC - UWSP, Stevens Point, WI 54481; (715) 346-4950; fax: (715) 346-3025.

Thank you very much for your time and consideration in this effort. We hope you will join us!

The activities that will be sent to you are from the "Windows on the Wild" module called Biodiversity Basics. The activities are:

What's Your Biodiversity IQ?: A lighthearted quiz designed to introduce students to biodiversity issues. This will be followed by reading and discussing an interview with E.O. Wilson of Harvard University.

The Spice of Life: This activity gets students to explore their personal beliefs regarding biodiversity. Activity includes designing and creating ads for teaching others about biodiversity.

Panthers and Hippos...Oh My!: This activity uses the case of the Florida panther to investigate the major causes of biodiversity loss and how to slow the loss.

Secret Services: Through a charade-like game, students learn about some of the ecosystem services biodiversity provides for our world.

Future Worlds: Students will look at a list of 15 possible pieces of their future world, then fit them into a pyramid to reflect their priorities for the future. Afterward, they'll investigate ways people are working to make those possibilities turn into realities.

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For the Teacher

Thank you for participating in the "Windows on the Wild" pilot! There are a few guidelines that we want to provide you with to assure that the pilot is conducted consistently with all participating teachers.

1. We ask that you conduct the **five activities within a two-week span**. However, please do not spend more than one day per activity. (In other words, you may want to skip a day or two between activities or conduct them five days in a row.) (Turn this page over for a visual layout.)

2. A day or two before you start using the activities, give your class the pre-test. Your students should have a whole class period to take the pre-test. If possible, do not let more than two days pass between conducting the pre-test and using the activities.

3. Within two days of finishing the last activity, please give your students the post-test. The post-test will be the exact same test as the pre-test, so it is very important that you do not discuss the answers between the two.

4. In summary, your whole pilot should take seven days to complete. These seven days should be within a **span of two weeks and two days** - two weeks within which you choose five days to conduct the five activities, and a day on either end to conduct the pre- and post-tests.)

Instructions for Piloting Days:

Day One: Pass out the test booklets, answer sheets, and no. 2 pencils. Make sure your students do not write on the testing booklets (because they will be used for the post-test as well, but don't tell them this!) The special code for your class's pre-test is _____. Have each student fill this in under the "Special Code" section on their answer sheet. You may want to go over the instructions and practice questions printed in each booklet. Give your students the whole hour for taking the pre- test, if necessary. Please do not discuss the answers with your students at any time, until the piloting and the post-test are complete.

Days Two-Day Six: Take five days to conduct the five activities in the order that is described with your activity packet. Please make sure that your students understand that they will not be spending more than one day on each activity. (However, if you would like to follow up on any of the activities, please just wait to do so until after the students have taken the post-test.)

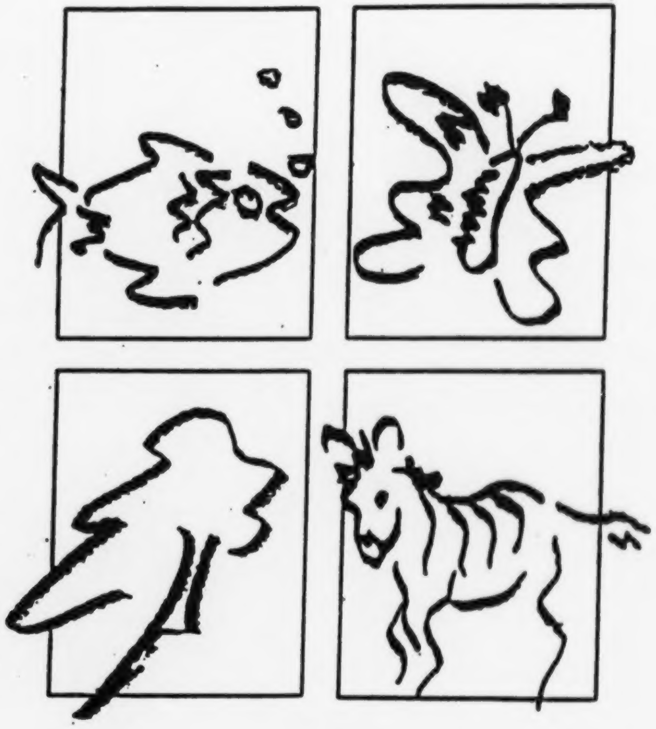
Day Seven: Pass out the test booklets, answer sheets, and no. 2 pencils. The special code for your class's post test is: _____. Have each student fill this in on their answer sheet. Once again, make sure students have a full class period for taking the post-test.

We have included an envelope for you to return the answer sheets from both the pre-test and the post-test. **(Please make sure the special code section is filled in appropriately for each class - for both the pre- and the post-test answer sheets.)** We do not need the survey booklets back. However, we would appreciate hearing your own comments on the survey questions. Please feel free to return a booklet that has your thoughts written down.

Have fun! And again, thank you for your participation!

Formative Evaluation Instrument

“Windows on the Wild”
Middle School
Biodiversity Survey



World Wildlife Fund
Wisconsin Center for Environmental Education
April 1996

Instructions

Please mark your answers on the answer sheet. Use a #2 pencil to darken the circle you choose. Do not make marks outside the circle.

This survey has three parts. We will discuss the directions first and then you will have the rest of the class period to complete each part of the survey. You will also find written directions at the start of each section.

Part One asks you for some information about yourself. Fill in the circle on your answer sheet that most closely matches what you would say.

Part Two asks what you think about some statements and sets of statements. There are no right or wrong answers. An example might be: "I spend too much time in school."

If you strongly agree with the statement...	fill in circle **A** (strongly agree)
If you agree with the statement...	fill in circle **B** (agree)
If you disagree with the statement...	fill in circle **C** (disagree)
If you strongly disagree with the statement...	fill in circle **D** (strongly disagree)

Part Three asks about what you know. Choose the **best** answer for each question. Notice that there are now **five** choices: **A**, **B**, **C**, **D**, and **E**.

Here's a practice question.

PRACTICE:

The state of New York is ________ of the state of Colorado.

a) south
b) north
c) west
d) east
e) don't know

Don't worry if you don't know all the answers. Just do your best. And take time to think about each question -- there's no need to rush. Have fun!

Part One

Please answer the following questions on your answer sheet.

1. What is your gender?

   a) female
   b) male

2. Compared to other subjects you study, how do you feel about studying environmental topics?

   a) less interested
   b) about the same
   c) more interested

3. Compared with other students your age, how well do you understand problems related to the environment?

   a) above average
   b) average
   c) below average

To what degree have each of the following contributed to your understanding of the environment and environmental problems?

a great deal (a)	some (b)	hardly any (c)	none (d)

4. school
5. books, newspapers, or magazines I have read on my own
6. special programs or activities such as clubs, scouting, or 4H
7. television programs
8. family and family activities
9. friends

Part Two

Fill in the circle on your answer sheet that best matches what you think or feel about each statement.

strongly agree	agree	disagree	strongly disagree
(a)	(b)	(c)	(d)

10. A plant or animal can be important just because it is interesting to watch.

11. If I wanted to, I could help get a law passed to protect plants and animals.

12. I could convince my classmates to protect plants and animals.

13. If I saw a person break the law and harm wildlife, it wouldn't do much good to report the person because adults usually don't listen to people my age.

14. If I do things like planting trees and putting up nesting boxes, this can help animals that are in danger of becoming threatened or extinct.

15. Even if I refuse to buy things that use a lot of resources, my actions won't matter because so many others are still buying too much.

16. Even though there are less than 6,000 tigers left in the wild, I am sure there will still be some left in the wild when I'm an adult.

17. Twenty years from now, I think my community will be a better place to live.

18. I believe that endangered species are doomed no matter what we do.

19. I think it is my responsibility to let people know how the things they buy can affect the environment.

20. The things I do every day show how I protect the environment.

21. It is my responsibility to try to get my school to do things like recycle and use less paper.

22. I think that it's my responsibility to help protect species.

23. When someone owns land, they should be able to build on it or do whatever they want with it.

24. We should limit the use of bicycles, boats, and other vehicles if they harm the environment.

25. I believe that my friends need to make changes in their lives to protect the environment.

26. People in the city have more important things to worry about than the loss of plants, animals, and ecosystems.

27. I think we should limit the number of people on the planet to protect the environment.

28. I think that people like scientists and engineers can solve most of the world's environmental problems.

29. I think it's impossible to protect the environment and still protect people's jobs.

30. Most people I know should change how they live to help solve environmental problems.

For the next three sets of statements, read the heading and mark how you think or feel about each statement on your answer sheet.

strongly agree	agree	disagree	strongly disagree
(a)	(b)	(c)	(d)

An important reason for studying about the diversity of plants, animals, and ecosystems is because:

31. I want to know what I can do to help protect them.

32. there are many interesting jobs relating to these things.

33. some of the species may be gone by the time I am an adult.

34. we use many species for food and medicine.

35. my future, as well as future generations, depend on healthy ecosystems.

very important	important	a little important	not important at all
(a)	(b)	(c)	(d)

Consider the following people. How important do you think the protection of biodiversity should be for each group?

36. scientists
37. people who live in the city
38. kids my age
39. people who live in Africa
40. loggers
41. people who live in the country
42. businessmen

very important	important	a little important	not important at all
(a)	(b)	(c)	(d)

How important do you think it is to protect each of the following kinds of plants and animals?

43. hummingbirds
44. frogs
45. worms
46. vultures
47. fungi
48. bats

Part Three

For each of the following, please choose the answer that you believe most correctly answers the question. Mark the answer on your answer sheet. *Note that there are now five choices instead of four.

49. Biodiversity is the diversity of life on Earth . To learn more about biodiversity, scientists study these levels of diversity:

a) species, ecosystems
b) ecosystems, genetics, endangered species
c) ecosystems, wildlife
d) ecosystems, genetics, species
e) don't know

50. Grevy's zebra is an endangered species in Africa. The stripes on one Grevy's zebra can look very different from the stripes of another Grevy's zebra. This is **most likely** a result of:

a) genetic diversity.
b) ecosystem diversity.
c) species diversity.
d) a and c
e) don't know

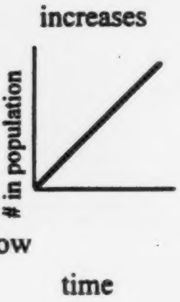
51. Scientists have identified approximately 1.5 million species living on Earth. Most scientists feel that this number is probably:

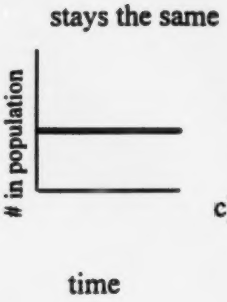
a) a little more than the total number of species that exist.
b) much too high, and many species have been incorrectly identified.
c) only a portion of the total that exist.
d) about half the number of living species.
e) don't know

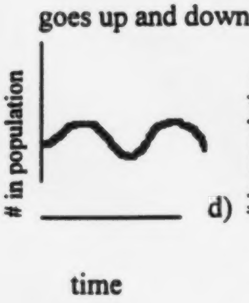
52. An interacting community of living things and their environment is called a(n):

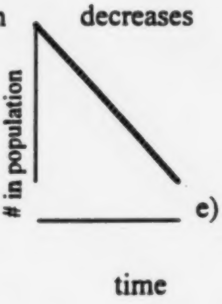
a) habitat.
b) food chain.
c) population.
d) ecosystem.
e) don't know

53. Which of the following graphs represents the typical trend of most populations over time?

a) 

b) 

c) 

d) 

e) don't know

54. Which of the following is true about extinction?

a) It's not a natural process because the last big species to become extinct were the dinosaurs.
b) It's a natural process, but the rate of extinction is increasing because of people's actions.
c) It's not a natural process because people are the only species that can cause other species to become extinct.
d) It's a natural process, but the rate of extinction is decreasing because people are protecting endangered species.
e) don't know

55. There are five major reasons for biodiversity loss. Which list below best describes these?

a) introduced species, pollution, overpopulation, predators, hunting
b) habitat loss, introduced species, pollution, overpopulation, overconsumption
c) overfishing, pollution, overpopulation, infectious diseases, habitat loss
d) predators, introduced species, overconsumption, infectious diseases, hunting
e) don't know

56. As the number of humans on the planet increases, plant and animal species worldwide will probably:

a) be more likely to reproduce.
b) increase in diversity.
c) have a better chance of surviving, because there are more people to help save them.
d) be more seriously threatened.
e) don't know

57. In a sealed, healthy aquarium, the oxygen is produced by:

a) water plants.
b) fish.
c) snails.
d) water.
e) don't know

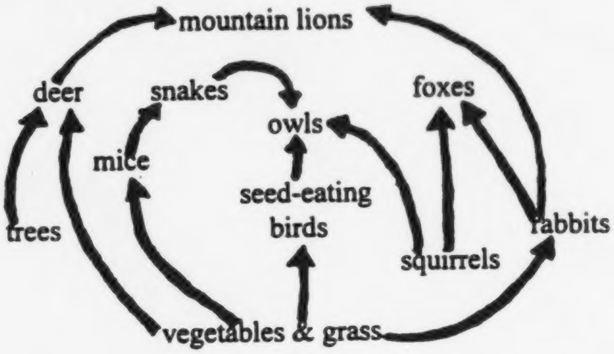
58. If all bacteria were suddenly removed from the Earth:

a) animals would have no difficulty in digesting food.
b) human diseases would disappear.
c) we would soon be knee deep in garbage and dead organic matter.
d) ecosystems would still work normally.
e) don't know

59. Some scientists are concerned that some of our major food crops may be wiped out by an insect or a fungus. The best way to make sure that this does not happen is to increase ______________ among plants.

a) genetic diversity
b) interdependence
c) ecosystem diversity
d) interactions
e) don't know

60. This diagram best describes a(n):


mountain lions
deer
snakes
foxes
owls
mice
seed-eating
birds
trees
rabbits
squirrels
vegetables & grass

a) food chain.
b) ecosystem.
c) species webscape.
d) food web.
e) don't know

61. Which of the following is true?

- a) All animals can adapt to changing conditions faster than plants.
- b) Smaller organisms take longer to adapt than larger organisms.
- c) Species either adapt over time or go extinct as a result of change.
- d) Adaptations usually only occur as a result of hurricanes, floods, and other disasters.
- e) don't know

62. Scientists are concerned that the world's frog populations are decreasing. Which of the following is **not** a reason for their concern?

- a) The decrease may mean that the habitat of other species is in danger.
- b) The decrease may mean that oxygen supplies on Earth are decreasing.
- c) The decrease may mean that air or water sources are polluted.
- d) Since frogs are part of many food webs, the decrease may harm other species.
- e) don't know

63. Scientists think that more species are becoming extinct today than in the past because:

- a) species are not as strong as they used to be.
- b) there are too many species in the world.
- c) habitat changes are happening too fast for species to adapt.
- d) all of the above
- e) don't know

64. If you wanted to preserve the biodiversity of a particular region, what would be the **most effective** approach to protect the region **and** its inhabitants?

- a) protect the endangered species
- b) protect the most abundant plants
- c) protect the predators
- d) protect the ecosystem
- e) don't know

65. Among the following, which group of living things has the largest number of identified species?

- a) insects
- b) plants
- c) mammals
- d) birds
- e) don't know

66. All of the following trends (I-IV) affect biodiversity. Which combination of two affect biodiversity the most?

I. Increasing number of people living in urban areas.
II. Increasing natural resource consumption by people.
III. Increasing human population.
IV. Increasing number of toxic waste dumps being cleaned up.

a) I and III
b) I and IV
c) I and II
d) II and III
e) don't know

67. If giraffes were released into the wild in the state of Texas, they would be called a(n):

a) native species.
b) introduced species.
c) endangered species.
d) threatened species.
e) don't know

68. Which of the following is **not** true about the human population?

a) It is declining in the United States and Canada.
b) It is expected to double within your lifetime.
c) Its increase has led to the loss of habitat around the world.
d) The greatest rate of population growth is occurring in some developing areas of South America and Africa.
e) don't know

69. If a shopping mall is built in a wetland area, the **most immediate** threat to the plants and animals that live there is:

a) an increase in the number of roadkills (animals killed by cars).
b) the loss of habitat.
c) air pollution from the increased traffic.
d) an increase in the number of people in the area.
e) don't know

70. When a farmer uses a strong pesticide to kill insects destroying his/her crop, which of the following is true?

a) This has no short term effect, but has a significant long term effect.
b) This has immediate effects, but no long term effects.
c) This has both short term and long term effects.
d) This has neither short term nor long term effects.
e) don't know

71. When working to help resolve an issue in your community, you would first:

a) learn more about the issue.
b) interview city/town council about their views.
c) write letters to people about how you felt on the issue.
d) survey citizens about their ideas.
e) don't know

72. What will probably happen if it becomes fashionable to wear necklaces made with owl feathers for good luck?

a) The number of wild owls will decrease and the price of wild owl feathers will increase.
b) The number of wild owls will decrease and the price of wild owl feathers will stay about the same.
c) The number of wild owls and the price of wild owl feathers will stay about the same.
d) The number of wild owls will increase and the price of wild owl feathers will stay about the same.
e) don't know

73. Which of the following is true?

a) People in India and China use more resources per person than people in most other countries.
b) As a country's population increases, people always use less resources because they learn to use them wisely.
c) People in Europe and Japan use about the same amount of resources per person as Americans do.
d) North Americans use more resources per person than people in most other countries.
e) don't know

74. Many people feel that by living in a sustainable way, we can help slow the loss of biodiversity. This means people should:

a) use natural resources in ways that protect them for the future.
b) never use animal products.
c) use technology to create more jobs.
d) make cities smaller so more people will live in the country.
e) don't know

75. Which of the following is **most** likely to help protect endangered species?

a) outlaw the sale of endangered species or products made from them (skins, furs, ivory, etc.).
b) protect the habitat where they live.
c) create zoos for key species.
d) use farming methods that do not damage habitat
e) don't know

76. An aquatic ecosystem is contaminated by a chemical which tends to remain stored in body fat. The highest concentration of this chemical would probably be found in which group of organisms in the ecosystem?

a) plant life
b) minnows
c) fish that eat insects and plants
d) birds that eat fish
e) don't know

77. Some people like to have tropical birds as pets. The **main** reason this could cause a species to become endangered is that:

a) the birds are often mistreated in people's homes.
b) the demand for them could reduce wild populations.
c) they escape from people's homes, and can die in the unfamiliar habitat.
d) their natural predators are increasing and taking over the birds' habitat.
e) don't know

78. The U.S. law that directly relates to protecting biodiversity is called:

a) The Migratory Waterfowl Act
b) The Superfund Act.
c) The Endangered Species Act..
d) The Wildlife Forever Act.
e) don't know

79. What is the **most helpful** way that your shopping habits can help preserve biodiversity?

a) Only buy items that can be recycled.
b) Buy fewer things.
c) Avoid buying products with extra packaging.
d) Make sure that the products you buy did not involve animal testing.
e) don't know

80. Which of the following is the **best** example of sustainable use of natural resources?

a) riding your bike instead of driving
b) using natural gas instead of oil to heat your home
c) using products that don't involve animal testing
d) using paper bags instead of plastic bags
e) don't know

Congratulations! You have reached the end of the survey!

Formative Evaluation Instrument
Relationship of Items to the Evaluation Outline

EVALUATION OUTLINE	Item numbers
I. COGNITIVE OUTCOMES	
A. Knowledge Of Ecological Principles And Processes Related To Biodiversity	
1. Three Levels of Biodiversity	49
a. Genetic Diversity	50, 59
b. Species Diversity	51, 65
c. Ecosystem Diversity	52, 64
2. Ecological Factors Affecting Biodiversity	
a. Ecosystem change	53
b. Evolution and extinction	54
3. The Ecological Value of Biodiversity	
a. Ecosystem, structure, function, and interdependence	57-58, 60, 62
b. Adaptation and resilience	61
B. Knowledge of Problems and Issues Related to Biodiversity	
1. Political, Economic, and Social Issues Affecting Biodiversity	55, 66
a. Habitat Destruction	63, 69
b. Introduction of Species	67
c. Population Growth	68, 56
d. Pollution	70, 76
e. Overconsumption	72, 73, 77
2. The Value of Biodiversity to Humans	*
a. Food/Water/Shelter/Oxygen	
b. Medicine	
c. Aesthetics/Pleasure/Recreation	
3. Science and Technology	
a. Ways it helps biodiversity	
b. Ways it decreases biodiversity	
C. Knowledge of Biodiversity Issue Investigation and Action Strategies	
1. Knowledge of strategies used to investigate biodiversity problems and issues.	71
2. Knowledge of appropriate action strategies for the prevention or resolution of biodiversity problems and issues.	74-75, 78-80

II. AFFECTIVE OUTCOMES	
A. Sensitivity Towards and Positive Values for the Prevention and Remediation of Biodiversity Problems and Issues	
1. Sensitivity	10
2. Values	31-48
B. Beliefs about Personal and Societal Efficacy Relating to Biodiversity (Predictors of Behavior)	
1. Locus of Control **a. Political Action**	11
b. Persuasion	12
c. Ecomanagement	14
d. Consumerism	15
e. Legal Action	13
2. Hopefulness/Hopelessness	16-18
3. Assumptions of Personal Responsibility	19-22
4. Societal Responsibility	23-30

Appendix J

Formative Evaluation
Item Results

Formative Evaluation Item Results

Part One
Please answer the following questions on your answer sheet.

Note: In some cases percentages do not add to 100 because of missing or erroneous data.

1. What is your gender? (N=174)

		% Pre (N=174)	*% Post (N=174)*
a)	female	53	53
b)	male	47	47

2. Compared to other subjects you study, how do you feel about studying environmental topics?

		% Pre (N=173)	*% Post (N=174)*
a)	less interested	21	21
b)	about the same	54	53
c)	more interested	25	26

3. Compared with other students your age, how well do you understand problems related to the environment?

		% Pre (N=174)	*% Post (N=174)*
a)	above average	27	28
b)	average	67	66
c)	below average	5	6

To what degree have each of the following contributed to your understanding of the environment and environmental problems?

4. school	a great deal (a)	some (b)	hardly any (c)	none (d)
% Pre (N=174)	29	52	16	3
% Post (N=174)	32	56	19	3

5. books, newspapers, or magazines I have read on my own	a great deal (a)	some (b)	hardly any (c)	none (d)
% Pre (N=174)	29	44	20	5
% Post (N=174)	21	47	24	7

6. special programs or activities such as clubs, scouting, or 4H	a great deal (a)	some (b)	hardly any (c)	none (d)
% Pre (N=174)	18	31	24	24
% Post (N=174)	17	32	24	27

7. television programs	a great deal (a)	some (b)	hardly any (c)	none (d)
% Pre (N=174)	39	34	20	7
% Post (N=173)	32	38	21	9

8. family and family activities	a great deal (a)	some (b)	hardly any (c)	none (d)
% Pre (N=174)	18	26	29	26
% Post (N=173)	14	33	27	25

9. friends	a great deal (a)	some (b)	hardly any (c)	none (d)
% Pre (N=174)	15	14	25	44
% Post (N=174)	10	18	28	43

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Part Two
Fill in the circle on your answer sheet that best matches what you think or feel about each statement.

strongly agree (a)	**agree (b)**	**disagree (c)**	**strongly disagree (d)**

10. A plant or animal can be important just because it is interesting to watch.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=174)	16	33	35	16
% Post (N=174)	20	37	28	14

11. If I wanted to, I could help get a law passed to protect plants and animals.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=174)	22	44	25	9
% Post (N=174)	11	57	22	9

12. I could convince my classmates to protect plants and animals.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=174)	9	43	36	12
% Post (N=173)	9	38	42	10

13. If I saw a person break the law and harm wildlife, it wouldn't do much good to report the person because adults usually don't listen to people my age.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=174)	19	23	25	32
% Post (N=174)	15	20	39	26

14. If I do things like planting trees and putting up nesting boxes, this can help animals that are in danger of becoming threatened or extinct.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=174)	37	49	12	2
% Post (N=174)	34	54	10	2

15. Even if I refuse to buy things that use a lot of resources, my actions won't matter because so many others are still buying too much.

	strongly agree	agree	disagree	strongly disagree
	(a)	(b)	(c)	(d)
% Pre (N=174)	11	36	33	20
% Post (N=173)	15	32	33	20

16. Even though there are less than 6,000 tigers left in the wild, I am sure there will still be some left in the wild when I'm an adult.

	strongly agree	agree	disagree	strongly disagree
	(a)	(b)	(c)	(d)
% Pre (N=172)	11	30	40	19
% Post (N=173)	8	33	39	19

17. Twenty years from now, I think my community will be a better place to live.

	strongly agree	agree	disagree	strongly disagree
	(a)	(b)	(c)	(d)
% Pre (N=172)	8	25	41	26
% Post (N=173)	8	28	39	25

18. I believe that endangered species are doomed no matter what we do.

	strongly agree	agree	disagree	strongly disagree
	(a)	(b)	(c)	(d)
% Pre (N=173)	5	14	43	38
% Post (N=172)	3	19	35	41

19. I think it is my responsibility to let people know how the things they buy can affect the environment.

	strongly agree	agree	disagree	strongly disagree
	(a)	(b)	(c)	(d)
% Pre (N=174)	15	39	33	13
% Post (N=173)	10	43	40	7

20. The things I do every day show how I protect the environment.

	strongly agree	agree	disagree	strongly disagree
	(a)	(b)	(c)	(d)
% Pre (N=174)	9	41	39	10
% Post (N=172)	17	43	30	9

21. It is my responsibility to try to get my school to do things like recycle and use less paper.

	strongly agree	agree	disagree	strongly disagree
	(a)	(b)	(c)	(d)
% Pre (N=174)	9	36	40	14
% Post (N=173)	11	37	42	10

22. I think that it's my responsibility to help protect species.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=174)	14	44	34	8
% Post (N=174)	14	43	32	11

23. When someone owns land, they should be able to build on it or do whatever they want with it.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=174)	22	34	25	19
% Post (N=174)	22	34	31	13

24. We should limit the use of bicycles, boats, and other vehicles if they harm the environment.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=173)	17	32	37	14
% Post (N=174)	17	38	36	9

25. I believe that my friends need to make changes in their lives to protect the environment.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=174)	12	43	33	11
% Post (N=174)	16	42	32	10

26. People in the city have more important things to worry about than the loss of plants, animals, and ecosystems.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=173)	8	18	34	40
% Post (N=174)	10	23	28	39

27. I think we should limit the number of people on the planet to protect the environment.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=174)	11	19	28	41
% Post (N=173)	12	25	29	34

28. I think that people like scientists and engineers can solve most of the world's environmental problems.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=174)	8	30	46	16
% Post (N=174)	10	35	39	16

29. I think it's impossible to protect the environment and still protect people's jobs.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=173)	8	23	39	29
% Post (N=172)	10	23	42	25

30. Most people I know should change how they live to help solve environmental problems.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=173)	14	35	40	10
% Post (N=174)	14	41	33	13

For the next three sets of statements, read the heading and mark how you think or feel about each statement on your answer sheet.

An important reason for studying about the diversity of plants, animals, and ecosystems is because:

31. I want to know what I can do to help protect them.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=174)	30	48	18	3
% Post (N=174)	33	51	14	2

32. there are many interesting jobs relating to these things.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=174)	19	57	20	5
% Post (N=174)	25	55	17	3

33. some of the species may be gone by the time I am an adult.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=174)	40	47	9	5
% Post (N=173)	48	42	8	2

34. we use many species for food and medicine.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=174)	28	51	17	5
% Post (N=174)	35	51	9	6

35. my future, as well as future generations, depend on healthy ecosystems.

	strongly agree (a)	agree (b)	disagree (c)	strongly disagree (d)
% Pre (N=173)	43	45	9	3
% Post (N=174)	50	41	7	2

Consider the following people. How important do you think the protection of biodiversity should be for each group?

36. scientists

	very important (a)	important (b)	a little important (c)	not important at all (d)
% Pre (N=173)	59	32	7	2
% Post (N=174)	64	30	3	2

37. people who live in the city

	very important (a)	important (b)	a little important (c)	not important at all (d)
% Pre (N=173)	23	40	31	6
% Post (N=174)	32	36	28	5

38. kids my age

	very important (a)	important (b)	a little important (c)	not important at all (d)
% Pre (N=172)	40	35	17	7
% Post (N=174)	36	37	19	7

39. people who live in Africa

	very important (a)	important (b)	a little important (c)	not important at all (d)
% Pre (N=172)	30	43	17	8
% Post (N=173)	36	45	16	3

40. loggers

	very important (a)	important (b)	a little important (c)	not important at all (d)
% Pre (N=171)	27	25	25	22
% Post (N=174)	30	36	22	10

41. people who live in the country

	very important (a)	important (b)	a little important (c)	not important at all (d)
% Pre (N=173)	29	40	18	11
% Post (N=174)	39	39	16	6

42. businessmen

	very important (a)	important (b)	a little important (c)	not important at all (d)
% Pre (N=173)	20	34	21	24
% Post (N=174)	28	36	21	15

How important do you think it is to protect each of the following kinds of plants and animals?

43. hummingbirds

	very important (a)	important (b)	a little important (c)	not important at all (d)
% Pre (N=172)	46	30	19	4
% Post (N=174)	45	37	14	4

44. frogs

	very important (a)	important (b)	a little important (c)	not important at all (d)
% Pre (N=173)	47	29	17	5
% Post (N=174)	47	40	11	3

45. worms

	very important (a)	important (b)	a little important (c)	not important at all (d)
% Pre (N=173)	47	26	16	10
% Post (N=173)	51	32	12	5

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46. vultures

	very important (a)	important (b)	a little important (c)	not important at all (d)
% Pre (N=173)	37	30	21	12
% Post (N=174)	41	35	18	6

47. fungi

	very important (a)	important (b)	a little important (c)	not important at all (d)
% Pre (N=172)	33	28	22	16
% Post (N=174)	48	33	11	9

48. bats

	very important (a)	important (b)	a little important (c)	not important at all (d)
% Pre (N=173)	38	30	18	13
% Post (N=174)	43	37	13	7

Part Three
For each of the following, please choose the answer that you believe most correctly answers the question. Mark the answer on your answer sheet.
***Note that there are now five choices instead of four.**

49. Biodiversity is the diversity of life on Earth . To learn more about biodiversity, scientists study these levels of diversity:

		% Pre (N=172)	*% Post (N=173)*
a)	species, ecosystems	8	17
b)	ecosystems, genetics, endangered species	16	19
c)	ecosystems, wildlife	19	15
d)	**ecosystems, genetics, species**	19	29
e)	don't know	38	20

50. Grevy's zebra is an endangered species in Africa. The stripes on one Grevy's zebra can look very different from the stripes of another Grevy's zebra. This is most likely a result of:

		% Pre (N=171)	*% Post (N=172)*
a)	**genetic diversity.**	26	35
b)	ecosystem diversity.	6	8
c)	species diversity.	8	12
d)	a and c	37	32
e)	don't know	23	13

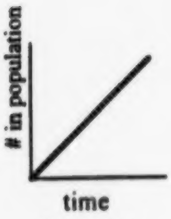
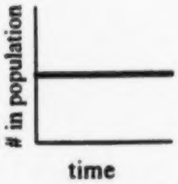
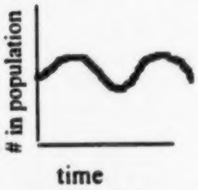
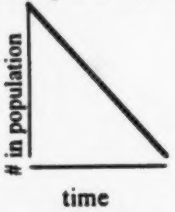
51. Scientists have identified approximately 1.5 million species living on Earth. Most scientists feel that this number is probably:

		% Pre (N=173)	*% Post (N=173)*
a)	a little more than the total number of species that exist.	12	13
b)	much too high, and many species have been incorrectly identified.	8	3
c)	**only a portion of the total that exist.**	35	48
d)	about half the number of living species.	14	17
e)	don't know	30	19

52. An interacting community of living things and their environment is called a(n):

		% Pre (N=173)	*% Post (N=173)*
a)	habitat.	40	31
b)	food chain.	8	9
c)	population.	7	5
d)	**ecosystem.**	36	46
e)	don't know	9	9

53. Which of the following graphs represents the typical trend of most populations over time?

	% Pre (N=173)	*% Post (N=173)*
a)  increases	37	41
b)  stays the same	6	5
c)  goes up and down	39	35
d)  decreases	10	10
e) don't know	9	9

54. Which of the following is true about extinction?

		% Pre (N=171)	*% Post (N=173)*
a)	It's not a natural process because the last big species to become extinct were the dinosaurs.	6	8
b)	**It's a natural process, but the rate of extinction is increasing because of people's actions.**	47	60
c)	It's not a natural process because people are the only species that can cause other species to become extinct.	19	16
d)	It's a natural process, but the rate of extinction is decreasing because people are protecting endangered species.	13	4
e)	don't know	15	12

55. There are five major reasons for biodiversity loss. Which list below best describes these?

		% Pre (N=173)	Post (N=173)
a)	introduced species, pollution, overpopulation, predators, hunting	8	17
b)	**habitat loss, introduced species, pollution, overpopulation, overconsumption**	29	50
c)	overfishing, pollution, overpopulation, infectious diseases, habitat loss	18	13
d)	predators, introduced species, overconsumption, infectious diseases, hunting	13	8
e)	don't know	32	13

56. As the number of humans on the planet increases, plant and animal species worldwide will probably:

		% Pre (N=173)	% Post (N=173)
a)	be more likely to reproduce.	6	9
b)	increase in diversity.	6	8
c)	have a better chance of surviving, because there are more people to help save them.	8	8
d)	**be more seriously threatened.**	69	66
e)	don't know	11	10

57. In a sealed, healthy aquarium, the oxygen is produced by:

		% Pre (N=173)	% Post (N=173)
a)	**water plants.**	48	52
b)	fish.	10	10
c)	snails.	9	5
d)	water.	13	13
e)	don't know	21	20

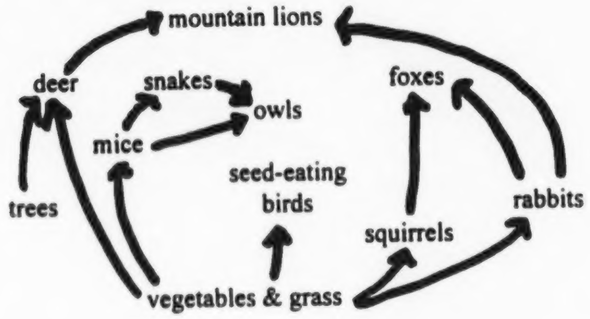
58. If all bacteria were suddenly removed from the Earth:

		% Pre (N=173)	% Post (N=173)
a)	animals would have no difficulty in digesting food.	4	8
b)	human diseases would disappear.	20	20
c)	**we would soon be knee deep in garbage and dead organic matter.**	43	50
d)	ecosystems would still work normally.	7	5
e)	don't know	26	18

59. Some scientists are concerned that some of our major food crops may be wiped out by an insect or a fungus. The best way to make sure that this does not happen is to increase _______among plants.

		% Pre (N=173)	*% Post (N=172)*
a)	**genetic diversity**	15	24
b)	interdependence	8	10
c)	ecosystem diversity	15	17
d)	interactions	7	8
e)	don't know	55	40

60. This diagram best describes a(n):


mountain lions
deer
snakes
owls
foxes
mice
seed-eating birds
trees
rabbits
squirrels
vegetables & grass

		% Pre (N=173)	*% Post (N=173)*
a)	food chain.	52	47
b)	ecosystem.	5	4
c)	species webscape.	5	4
d)	**food web.**	36	42
e)	don't know	2	3

61. Which of the following is true?

		% Pre (N=169)	*% Post (N=172)*
a)	All animals can adapt to changing conditions faster than plants.	7	13
b)	Smaller organisms take longer to adapt than larger organisms.	6	6
c)	**Species either adapt over time or go extinct as a result of change.**	56	53
d)	Adaptations usually only occur as a result of hurricanes, floods, and other disasters.	8	9
e)	don't know	24	20

62. Scientists are concerned that the world's frog populations are decreasing. Which of the following is not a reason for their concern?

		% Pre (N=169)	*% Post (N=171)*
a)	The decrease may mean that the habitat of other species is in danger.	8	11
b)	**The decrease may mean that oxygen supplies on Earth are decreasing.**	43	40
c)	The decrease may mean that air or water sources are polluted.	12	10
d)	Since frogs are part of many food webs, the decrease may harm other species.	15	16
e)	don't know	22	24

63. Scientists think that more species are becoming extinct today than in the past because:

		% Pre (N=168)	*% Post (N=171)*
a)	species are not as strong as they used to be.	4	3
b)	there are too many species in the world.	8	3
c)	**habitat changes are happening too fast for species to adapt.**	52	61
d)	all of the above	27	26
e)	don't know	9	7

64. If you wanted to preserve the biodiversity of a particular region, what would be the **most effective** approach to protect the region and its inhabitants?

		% Pre (N=166)	*% Post (N=168)*
a)	protect the endangered species	14	21
b)	protect the most abundant plants	7	5
c)	protect the predators	5	6
d)	**protect the ecosystem**	49	52
e)	don't know	24	16

65. Among the following, which group of living things has the largest number of identified species?

		% Pre (N=168)	*% Post (N=169)*
a)	**insects**	48	53
b)	plants	17	13
c)	mammals	17	19
d)	birds	4	5
e)	don't know	13	9

66. All of the following trends (I-IV) affect biodiversity. Which combination of two affect biodiversity the most?

I. Increasing number of people living in urban areas.
II. Increasing natural resource consumption by people.
III. Increasing human population.
IV. Increasing number of toxic waste dumps being cleaned up.

		% Pre (N=168)	*% Post (N=168)*
a)	I and III	17	17
b)	I and IV	10	14
c)	I and II	14	19
d)	**II and III**	27	32
e)	don't know	33	18

67. If giraffes were released into the wild in the state of Texas, they would be called a(n):

		% Pre (N=168)	*% Post (N=169)*
a)	native species.	14	13
b)	**introduced species.**	57	69
c)	endangered species.	7	7
d)	threatened species.	8	2
e)	don't know	14	9

68. Which of the following is not true about the human population?

		% Pre (N=168)	*% Post (N=168)*
a)	**It is declining in the United States and Canada.**	38	45
b)	It is expected to double within your lifetime.	14	13
c)	Its increase has led to the loss of habitat around the world.	10	12
d)	The greatest rate of population growth is occurring in some developing areas of South America and Africa.	15	13
e)	don't know	24	

70. When a farmer uses a strong pesticide to kill insects destroying his/her crop, which of the following is true?

		% Pre (N=165)	*% Post (N=166)*
a)	This has no short term effect, but has a significant long term effect.	11	13
b)	This has immediate effects, but no long term effects.	14	10
c)	**This has both short term and long term effects.**	44	42
d)	This has neither short term nor long term effects.	2	8
e)	don't know	29	26

71. When working to help resolve an issue in your community, you would first:

		% Pre (N=163)	*% Post (N=166)*
a)	**learn more about the issue.**	60	64
b)	interview city/town council about their views.	10	9
c)	write letters to people about how you felt on the issue.	13	7
d)	survey citizens about their ideas.	7	7
e)	don't know	10	13

72. What will probably happen if it becomes fashionable to wear necklaces made with owl feathers for good luck?

		% Pre (N=163)	*% Post (N=164)*
a)	**The number of wild owls will decrease and the price of wild owl feathers will increase.**	69	63
b)	The number of wild owls will decrease and the price of wild owl feathers will stay about the same.	14	9
c)	The number of wild owls and the price of wild owl feathers will stay about the same.	4	9
d)	The number of wild owls will increase and the price of wild owl feathers will stay about the same.	4	7
e)	don't know	9	13

73. Which of the following is true?

		% Pre (N=163)	*% Post (N=166)*
a)	People in India and China use more resources per person than people in most other countries.	7	10
b)	As a country's population increases, people always use less resources because they learn to use them wisely.	8	11
c)	People in Europe and Japan use about the same amount of resources per person as Americans do.	7	16
d)	**North Americans use more resources per person than people in most other countries.**	36	34
e)	don't know	42	30

74. Many people feel that by living in a sustainable way, we can help slow the loss of biodiversity. This means people should:

		% Pre (N=162)	*% Post (N=166)*
a)	**use natural resources in ways that protect them for the future.**	46	50
b)	never use animal products.	12	14
c)	use technology to create more jobs.	10	10
d)	make cities smaller so more people will live in the country.	7	4
e)	don't know	24	22

75. Which of the following is **most** likely to help protect endangered species?

		% Pre (N=161)	*% Post (N=166)*
a)	outlaw the sale of endangered species or products made from them (skins, furs, ivory, etc.).	25	18
b)	**protect the habitat where they live.**	47	49
c)	create zoos for key species.	11	11
d)	use farming methods that do not damage habitat	9	8
e)	don't know	9	13

76. An aquatic ecosystem is contaminated by a chemical which tends to remain stored in body fat. The highest concentration of this chemical would probably be found in which group of organisms in the ecosystem?

		% Pre (N=160)	*% Post (N=165)*
a)	plant life	14	15
b)	minnows	11	8
c)	fish that eat insects and plants	13	23
d)	**birds that eat fish**	20	21
e)	don't know	42	33

77. Some people like to have tropical birds as pets. The **main** reason this could cause a species to become endangered is that:

		% Pre (N=159)	*% Post (N=165)*
a)	the birds are often mistreated in people's homes.	16	18
b)	**the demand for them could reduce wild populations.**	36	41
c)	they escape from people's homes, and can die in the unfamiliar habitat.	19	12
d)	their natural predators are increasing and taking over the birds' habitat.	13	12
e)	don't know	16	18

78. The U.S. law that directly relates to protecting biodiversity is called:

		% Pre (N=159)	*% Post (N=166)*
a)	The Migratory Waterfowl Act.	5	6
b)	The Superfund Act.	7	12
c)	**The Endangered Species Act.**	35	31
d)	The Wildlife Forever Act.	15	20
e)	don't know	38	31

79. What is the most helpful way that your shopping habits can help preserve biodiversity?

		% Pre (N=159)	*% Post (N=165)*
a)	Only buy items that can be recycled.	24	21
b)	**Buy fewer things.**	11	10
c)	Avoid buying products with extra packaging.	23	32
d)	Make sure that the products you buy did not involve animal testing.	25	27
e)	don't know	18	10

80. Which of the following is the best example of sustainable use of natural resources?

		% Pre (N=159)	*% Post (N=166)*
a)	**riding your bike instead of driving**	50	41
b)	using natural gas instead of oil to heat your home	12	19
c)	using products that don't involve animal testing	11	11
d)	using paper bags instead of plastic bags	10	14
e)	don't know	18	15

Congratulations! You have reached the end of the survey!

Appendix K

Formative Evaluation
Subscale Results

Summary of Subscale Mean Scores for Formative Evaluation of *Windows on the Wild* - Spring 1996

SubScale:	**Whole Group** pretest mean* posttest mean significance** (N=174)	**Arlington, VA** pretest mean* posttest mean significance** (N=81)	**Seattle, WA** pretest mean* posttest mean significance** (N=93)
Attitudes/Values	1.98 (pre) 2.13 (post) .000 (sig)	1.99 (pre) 2.13 (post) .000 (sig)	1.98 (pre) 2.13 (post) .000 (sig)
Cognitive	0.41 (pre) 0.45 (post) .001 (sig)	0.47 (pre) 0.47 (post) .942 (sig)	0.36 (pre) 0.44 (post) .000 (sig)
Efficacy (LOC etc.)	1.62 (pre) 1.63 (post) .843 (sig)	1.68 (pre) 1.69 (post) .85 (sig)	1.57 (pre) 1.58 (post) .91 (sig)

* **Note**: Mean scores for the attitude/values and efficacy subscales were calculated based on a scale of from 0 to 3 where 3 equals the preferred response. Mean scores for the cognitive subscale were calculated based on a scale of from 0 to 1 where 1 equals the preferred response.

** Changes in scores from pretest to posttest were considered to be significant if the probability level was less than .050.

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